



中华人民共和国国家知识产权局

100037

中国国际贸易促进委员会专利商标事务所
北京市阜成门外大街 2 号万通新世界广场 8 层
朱德强

发文日期

2005 年 4 月 6 日

申请号: 200510059163.8

专利申请受理通知书

根据专利法第二十八条及其实施细则第三十九条、第四十条的规定, 申请人提出的专利申请请国家知识产权局予以受理。现将确定的申请号和申请日通知如下:

申请号: 200510059163.8

申请日: 2005 年 3 月 24 日

申请人: 马克·努南

发明名称: 轮式铲

经核实确认国家知识产权局专利局收到如下文件:

发明专利请求书	每份页数: 3 份数: 2	说明书摘要	每份页数: 1 份数: 2
摘要附图	每份页数: 1 份数: 2	权利要求书	每份页数: 5 份数: 2
说明书	每份页数: 15 份数: 2	说明书附图	每份页数: 10 份数: 2
原文			

简要说明:

- 根据专利法第二十八条规定, 申请文件是邮寄的, 以寄出的邮戳日为申请日。若申请人发现上述申请日与邮寄申请文件之日不一致时, 可在收到本通知书起两个月内向国家知识产权局专利局受理处提交意见陈述书及挂号条存根, 要求办理更正申请日手续。
- 申请号是国家知识产权局给予每一件被受理的专利申请的代号, 是该申请最有效的识别标志。申请人向我局办理各种手续时, 均应准确、清晰地写明申请号。
- 寄给审查员个人的文件或汇款不具备法律效力。
- 中间文件、分案申请、要求本国优先权的申请应直接寄交国家知识产权局专利局受理处。

根据专利法实施细则第九十一条规定, 凡向专利局缴纳各种费用的应当写明正确的申请号或专利号以及费用名称, 未写明的视为未办理缴费手续。

审查员: 刘爱荣

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中华人民共和国国家知识产权局

回函请寄: 100088 北京市海淀区蔚蓝门桥西土城路 6 号 国家知识产权局专利局受理处收
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发明专利请求书

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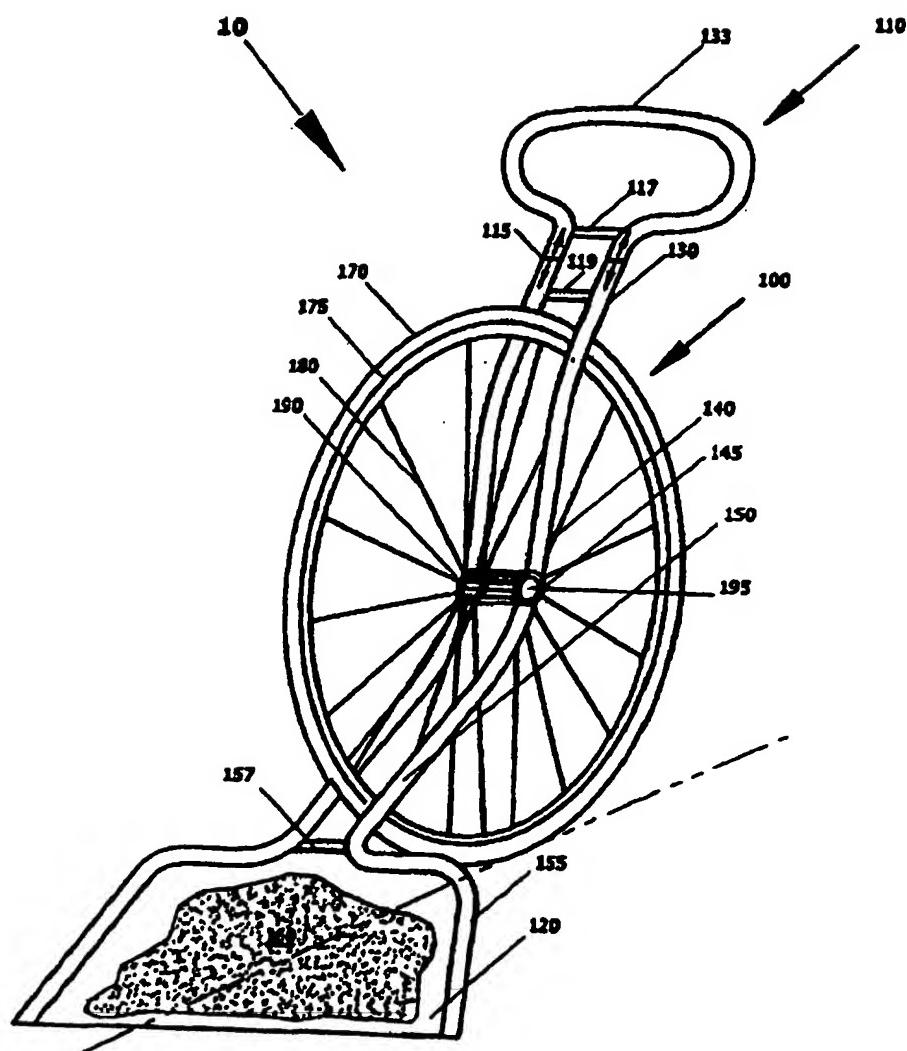
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(6) 发明名称	轮式铲				① 申请号 (发明) ② 分案提交日 ③ 申请日 ④ 费减审批 ⑤ 挂号号码			
	(7) 发明人	马克·努南						
		(8) 第一申请人		姓名或名称	马克·努南			
		单位代码或个人身份证号						
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(9) 联系人		地址	邮政编码		省、自治区、直辖市名称	美国 康涅狄格		市(县)名称
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	姓名		中国国际贸易促进委员会专利商标事务所				代 码	11038
(11) 代理机构	邮政编码	100037			电 话	68516688		
	地 址	北京市阜成门外大街2号万通新世界广场8层						
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	工作证号	1103806678.2			工作证号			
	电 话	68516688			电 话			
(12) 分案申请	原案申请号					原案申请日		

(13) 发明 名称	轮式铲																													
(14) 生物材料 样品保藏		保藏单位		地 址																										
		保藏日期		保藏编号		分类命名																								
(15) 要求优先权声明	在先申请 国别或地区	在先申请日	在先申请号	(16) 不丧失新颖性 宽限期声明	<input type="checkbox"/> 已在中国政府主办或承认的国际展览会上首次展出 <input type="checkbox"/> 已在规定的学术会议或技术会议上首次发表 <input type="checkbox"/> 他人未经申请人同意而泄露其内容																									
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说 明 书 摘 要

一种装置，包括位于一个相对较大的轮子上的铲子，以及一种利用该装置处理材料装料的方法。该装置包括一个铲子，该铲子在一个拉长轭的末端具有一个把手，该轭在中间部分安装到一个相对较大的轮子的轴上，以利用操作该把手的人的快速手臂/身体运动，来抓取装料、将其传输到目的地并从板上推出该装料。该基本高与腰齐的轮子用于经把手的接收作为有效的杠杆作用的操作者的身体力量，并从轮子产生反作用力以增强本发明的装置的掷力，本发明的装置包括铲、轮子以及作为驱动部件的轭。

摘要附图



权利要求书

1. 一种用于材料的移除和处置的装置，包括：
 轮组件，其具有轮辋和轴，轮辋和轴利用从轴径向伸出的辐条而连接在一起，该轴包括能传输相对于作用的回弹反作用的支轴部件；
 轭，其具有上部、中间部分以及下部，其中中间部分连接到轴的支轴部件，并具有“S形状”，该“S形状”由下部包括的角 Φ' 和上部包括的角 Φ 限定，其中角 Φ' 在 80° 到 90° 之间；
 把手，其连接到驱动部件的上部，并能够移动轮组件，其中轭的长度和把手的高度之间的比值大于 $1:1$ ；
 铲板，其连接到驱动部件的下部，该铲板用于，当通过提升把手并向前推动把手而将铲板放低到一个表面时，从该表面拾取材料装料；
 其中当把手被向下推动，以使得轮子挤压并经轮子的轴上的支轴部件回弹时，铲板向上和向前弹跳，从而轻快的将材料装料从该装置中释放出去。
2. 根据权利要求 1 的装置，其中下部包括的角 Φ 在大约 110° 到 165° 之间。
3. 根据权利要求 1 的装置，其中轮组件具有将轮组件从驱动部件拆开的快速拆卸功能。
4. 根据权利要求 1 的装置，其中下部包括的角 Φ 在大约 80° 到 90° 之间。
5. 根据权利要求 4 的装置，其中铲板包括弯曲表面，并具有沿外周的侧壁，侧壁从铲板的后部到铲板的导缘呈锥形。
6. 根据权利要求 1 的装置，其中轭在所述中间部分具有带凹口的部件，其中凹口构造成用于对轭相对于轴进行不同的定位连接。
7. 根据权利要求 1 的装置，其中铲板通过连接板和固定元件连接到轭，其中连接板具有对应于铲板中的孔的孔，固定元件将这些对应的孔彼此固定。

8. 根据权利要求 1 的装置，其中铲板末梢和支轴区域之间的距离是大约 32 到 42 英寸。
9. 根据权利要求 8 的装置，其中把手从轮子下面的基准面开始的高度在 48 到 60 英寸之间。
10. 根据权利要求 8 的装置，其中把手从轴的中心开始的高度在 26 到 42 英寸之间。
11. 根据权利要求 1 的装置，其中上部包括的角 Φ 可选的在大约 80° 到 110° 之间。
12. 根据权利要求 1 的装置，其中装置的整体长度在大约 78 到 88 英寸之间，并能增加到大约 89 到 100 英寸之间。
13. 根据权利要求 1 的装置，其中下部包括的角 Φ 在大约 140° 到 160° 之间。
14. 根据权利要求 1 的装置，其中把手从直接位于轮子下面的基准面开始的高度在大约 48 到 60 英寸之间，并能增加到大约 42 到 66 英寸之间。
15. 根据权利要求 7 的装置，其中连接板是角形的。
16. 根据权利要求 1 的装置，其中把手构造成可相对于轭进行位置调整。
17. 一种用于材料的移除和处置的装置，包括：
轮组件，其具有轮辋和轴，该轴还包括具有两端的管形体，该管形体用于接收将轴连接到轮辋上的辐条；
该轴还适用于在轴的两端上接收多个弹簧，以作为支轴，并传输对于施加到轴上的作用的回弹反作用；
细长的 U 形的驱动部件，具有弯曲上部、基本成直线的中间部分以及敞开的下部，其中中间部分连接到轴的每一端处的弹簧上；
把手，其由驱动部件的上部形成，该把手能够移动轮组件；
铲板，其连接到驱动部件的下部，该铲板适用于，当通过提升把手并向前推动把手而将铲板放低到一个表面时，从该表面拾取材料装料；

其中当把手被向下推动，以使得弹簧受挤压并经轮子的轴上的支轴部件回弹时，铲板向上和向前弹跳，从而轻快的将材料从该装置中释放出。

18. 根据权利要求 17 的装置，其中轴包括管形体，该管形体具有支承将轴连接到轮辋的辐条的第一和第二端，该管形体形成支轴部件。

19. 根据权利要求 17 的装置，其中多个弹簧包括一对弹簧，在轴的两端分别有一个弹簧。

20. 根据权利要求 17 的装置，其中该对弹簧在把手向下推时被压缩，该压缩提供了回弹反作用力。

21. 根据权利要求 17 的装置，其中铲板具有两个侧壁和一个后壁，以防止材料装料从铲板上洒出。

22. 根据权利要求 17 的装置，其中铲板形成为在底部具有半径的勺形。

23. 根据权利要求 17 的装置，其中驱动部件包括管形材料。

24. 根据权利要求 23 的装置，其中该管形材料包括金属。

25. 根据权利要求 17 的装置，其中把手经中空管形驱动部件内部的套叠伸缩管形材料而可滑动调整。

26. 根据权利要求 17 的装置，其中该装置的整体长度在大约 78 到 88 英寸之间，并能增加到大约 89 到 100 英寸之间。

27. 根据权利要求 17 的装置，其中轮子的直径在大约 30 英寸到 36 英寸之间。

28. 根据权利要求 17 的装置，其中把手从直接位于轮子下面的基准面开始的高度在 48 到 60 英寸之间，并能增加到大约 42 到 66 英寸之间。

29. 根据权利要求 17 的装置，其中材料装料包括沙子和碎石块。

30. 根据权利要求 17 的装置，其中材料装料包括雪和泥。

31. 一种移除雪的方法，包括以下步骤：

提供一个装置，该装置包括：基本位于操作者腰部高度处的相对大的轮子，具有闭合把手端和敞开端的轭，在轭的敞开端处的铲板，

其中轭在中间部分安装到轮子的轴上，所述中间部分基本上成“S形”并具有包括上弯部的上部和包括下弯部的下部，其中轭安装到轴上，并以如下方式构造而成，以使得随轭绕轴的运动上弯部移动距离 H，该距离 H 比下弯部移动的距离 A 要大；

通过推动把手并使轮子沿受把手操纵的方向滚动，从而沿路径移动该装置；

将位于该装置的路径上的材料装料铲到铲板上；

在拾取材料装料后，下压把手，以提升铲板到离开路径的高度；

进一步调整铲板的高度，以实现相对于轮子的轴并位于轮子的轴上方的装料平衡；

传输平衡的材料装料到目的地；

并在目的地轻快地在把手上施加身体重量，以推出材料装料到离装置相当远的距离。

32. 根据权利要求 31 的方法，其中所提供的该装置的轭具有上、下弯部之间的中间部分，该中间部分具有带凹口部件，该带凹口部件构造成用于允许轭相对于轴进行不同的定位连接。

33. 根据权利要求 31 的方法，其中所提供的该装置的整体长度在大约 78 到 88 英寸之间，并能增加到大约 89 到 100 英寸之间。

34. 根据权利要求 31 的方法，其中所提供的该装置具有连接到弯折轭连接板的“T 形”把手。

35. 根据权利要求 31 的方法，其中所提供的该装置具有把手部分，该把手部分相对于轭的位置是可调的。

36. 根据权利要求 31 的方法，其中所提供的该装置具有能旋转 360° 的把手部分。

37. 根据权利要求 31 的方法，其中所提供的该装置具有轴，该轴适用于在轴的两端处接收多个弹簧，以作为支轴并传输对于施加到轴上的作用的回弹反作用。

38. 根据权利要求 31 的方法，其中所提供的该装置具有轮子，该轮子适用于接收弹性材料，该弹性材料用于产生对于施加到轴上的作

用的回弹作用。

39. 根据权利要求 31 的方法，其中所提供的该装置具有铲板，该铲板具有弧形侧壁，该侧壁朝向铲板的导缘成锥形。

40. 根据权利要求 31 的方法，其中该装置具有弯曲的铲板。

41. 根据权利要求 31 的方法，其中所提供的该装置具有经角形连接板连接到钝的铲板。

说 明 书

轮式铲

技术领域

本发明主要涉及用于移动和消除材料的手动轮式运载工具。更具体而言，本发明涉及一种在轮子上的除雪铲，其中该轮子提供回弹作用以协助推动雪。

背景技术

许多手动轮式运载工具已经被用于协助从一个地方运送材料到另一个地方。当然，古老的手推车是人们熟知的。然而，除了单单运送之外，在运载工具上轻松的装载或卸载材料并对人体施加最小的压力和疲劳，已经要求有不同的方法。对于铲或犁雪就是如此，其中雪包括湿重的泥雪。

在美国专利 US 5,918,921 中，Samuelson 展示了一种用于移动雪的杆式铲。该铲包括用于装载雪的铲板、从铲板延伸的轴、用于接触水平面并从轴下垂的轮组件、以及由用户抓持并位于轴的最后端的把手组件。轮组件包括一个轴叉、旋转安装到该轴叉的轴、以及一对轮子，这一对轮子连接到该轴或一个倒 T 形部件，使得它的横向部分作为其轴，而一对轮子旋转连接到该轴。把手组件包括一个下横向部件以及一个扩展部件，该下横向部件用于用户的手的抓持，并从轴的最后端的两个侧面横向延伸，而扩展部件用于为用户利用有限的弯曲姿势而提升用户抓把手部件的点。

Jurkowski 等人在美国专利 US 5,511,327 中公开了一种轮式铲雪设备。该铲雪设备包括一个手推车，该手推车具有一个基本为 A 形结构的把手，带有一个横杆，包括一个从其上延伸的圆环。该手推车包括一个轴位于其轴线上的轮子，该轮子包括一对固定到轴的垂直支承杆，该轮子还包括一对固定到其轴上的水平柱。把手的下段联接到该

柱。雪铲具有一个形成为一个基本为方形部件的铲板，并模制成一个半圆形结构，铲板的后表面联接到手推车轮的水平柱的自由端。铲板具有一个固定到其后表面的木制轴，该轴延伸穿过该圆环到把手的横向杆上，垂直支承杆联接到该轴。

在另一种用于除雪的方法中，Petruzzelli 在美国专利 US 6,675,507 中公开了一种用于相对于轮式车架枢转运动的枢接铲板，其中铲板安装到车架上。该铲板在相对于车架移动的方向的不同角度被可调的固定到其位置，以用于当它沿地面移动时将雪或其它材料推到铲的侧面。该车架利用把手而前推，或者一个马达被提供用于自推车架。

在另一种方法中，Lobato 在美国专利 US 5,581,915 中公开了一种通过在要清除雪的区域犁雪而人工除雪的雪犁车架组件。该车架是一种人工推动式有轮结构，由多个枢旋连接的用于折叠的部件构成，其以具有把手直线长度部分的可替代的传统雪铲的形式构造而成，可折叠起来以便于收藏，也可打开以支承和传输雪犁。这样构造车架以使得雪铲把手可在其上活动式安装，倾斜于水平面，并相对于犁雪表面定义一个锐角。该雪铲倾斜度是可变的，用于相对于犁雪和除雪的表面建立铲的不同的锐角。

在美国专利 US 6,643,958 中，Krejci 公开了一种掷雪铲设备，用于从狭窄的人行道以及传统的清雪机不能使用的阶梯除雪。该掷雪铲设备包括一个勺铲组件，其包括一个外壳，该外壳具有顶部、底部、侧部和后部壁，还具有一个开口前部。该铲还包括一个拉长槽，其连接到该勺铲，其中雪经该槽移动。该铲还包括一个排出口，其旋转安装到拉长槽，把手部件连接到该拉长槽；还包括用于经拉长槽拾雪和移雪的部件。

因此，现有技术目前的情况是，主要提供两种特别通用的铲。一种可以提雪和掷雪，另一种可以像犁一样推雪。这些引用的现有技术参考内容整体结合作为参考。所需的是两种雪铲的结合，其中犁雪 (plowing) 型动作能结合到铲中，铲还能轻松的、以最少的人体不适地提雪和掷雪。

发明内容

本发明涉及一种轮式铲，其具有形成在细长的轭末端的把手，为抓取装料、将其传输到目的地、并利用操作该把手的人的快速身体（或臂）运动，该轭在其中间部分附近安装到相对大的轮子的轴上。该基本高与腰齐的轮子用于接收经把手的、作为有效的杠杆作用的操作者的身体力量，并从轮子产生回弹作用以增强本发明的装置的掷力，本发明的装置包括铲、轮子以及作为驱动部件的轭。

本发明的一个实施例涉及一种用于移除和处置材料的装置。该装置包括轮组件，该轮组件具有连接在一起的轮辋和轴，其中辐条从轴径向伸出。该轴包括支轴部件，其能够传输对于作用的回弹反作用。驱动部件具有上部分、中间部分以及下部分。中间部分大体上是S形的，其连接到轴的支轴部件。把手连接到驱动部件的上部分，其能够移动轮组件。铲板连接到驱动部件的下部分，当通过抬起把手将铲板放低到一个表面并向前推时，该铲板从该表面铲起材料装料。当把手向下推压时，该后下作用使得轮子挤压并通过轮子的轴上的支轴部件回弹。结果是，铲板向上向前弹起，从而轻爽地推动材料装料离开该装置。

本发明的实施例的一个方面包括，一种具有轮辋和轴的轮组件，该轴还包括管形体，该管形体具有两个末端以用于接收将轴连接到轮辋的辐条。该轴还用于在轴的两端接收多个弹簧，以用作支轴并传输对于施加到轴的作用的回弹反作用。一个细长的U形驱动部件具有弯曲上部、基本成直线的中间部分以及敞开下部。中间部分在轴的每一端处连接弹簧。把手形成驱动部件的上部，并能够移动轮组件。铲板连接到驱动部件的下部，当通过抬起把手将铲板放低到一个表面并向前推时，该铲板从该表面铲起材料。当把手向下推压使得弹簧挤压并通过轮子的轴上的支轴部件回弹时，铲板向上向前弹跳，从而轻爽地清除该材料离开该装置。

当该铲板构造成具有在铲板的前导边缘上的锥形壁的完全的弧形时，已经证实这样的铲板能提供更好的操纵特性，这是由于，当比如

雪的装料被收集到铲板上并且该装料从该铲板上弹起时，获得了铲板上装料的平均分布。一个圆形后壁使得铲板中的装料得以更平均的分布。例如，当装料通过铲板的一侧时，它偏转该弯曲后部，并引导装料到更空或空的侧面。重量的更均匀的分布使得掷雪更易，并使得用户利用更小的力就能避免该设备倾斜到一侧。当一个平的部分位于铲板的后壁时，发现这会使得铲板倾向于不均匀的分布装料，并由于铲板上的比如雪的装料的不平均分布，产生不想要的不平衡。

在一个实施例中，没有限制，铲板的壁可在其最高点达到大约 2 至 4 英寸，并锥形向下以致在铲板导缘的边缘附近几乎没有，铲的导缘可具有高达 28 英寸的宽度，例如在大约 20 到大约 28 英寸之间，铲板可具有从前到后的大约 14 到大约 22 英寸、或者大约 16 到大约 20 英寸的长度。

当铲板从它的侧面看本身是弯曲的时，可进一步改进操纵性。当铲板相对于铲板下的平面成大约 15° 到大约 35° 、或从大约 20° 到大约 30° 之间的任何角度时，发现铲板在铲捞和分撒材料方面具有更好性能。

铲板可包括铲板前端上的一个或多个突出，例如，叉形或长柄叉结构，以使得更易铲捞装料材料，比如腐土或盐。当装料预期为雪时，铲板还可进一步包括凿冰附件，其在铲板的导缘的前部延伸。在这种情况下，凿冰边缘，而不是铲板边缘，会接触地面，但仍然允许松冰或堆积的雪进入到铲上。该铲板还可在铲板的导缘装备一个金属耐磨带，这是一种可替换或不可替换的带子。

通过许多不同的机械结构，该铲板可连接到轭。例如，通过装配管子到铲内或铲上的槽中，来连接铲板。已经发现，通过铲板的下侧（铲板的未装料侧）上的连接板的连接，将增强铲板的紧固性，同时，当铲板撞击到比如堆积雪或冰的硬物时，还允许铲板边缘具有柔性。该板可在其内具有一个弯折，以进一步在铲板下向前延伸（更靠近导缘），从而更好地支承它。如果给出更大的间隙，板最好位于管子上方（当然，该管子在末端附近也可为平的）。在一个有利的实施例中，该

连接板从大约铲板的中间部分到铲板的大约导缘部分，在一点上连接到铲板的下侧。例如，利用一个钢铲板，已经发现，离铲板的导缘大约 2 至 4 英寸的连接板的前端会提供一个未预料到的有益的提/压区域，而不需要增加整个铲板材料的厚度和硬度。这种连接板及其定位还会提供当从侧面看铲板时在铲板中包含更大的曲度的能力，从而结合了强度。边缘最好更加柔性。

把手可以许多方式构成，比如以闭环、开口杆、双把手或直杆的方式。把手上的手柄可用于改善对于该装置的抓握。一种特别有用的杆是具有离开该机器的曲度的弯曲杆（也就是，朝用户伸出的把手）。

在一个实施例中，把手在轭上是可调的，以使得把手能够上下移动。例如，通过利用活动式支架或通过滑动把手部分到轭的一部分中，该把手可被可变的连接。在一个实施例中，把手构造成包括一个在轭的间隙（也就是，套环）中（例如，进入一个包括轭的一部分的管子中）的活动式管子，并能够滑入和滑出该间隙，以及能够旋转 260°，其最好固定在它的最终位置。

在另一个实施例中，把手部件经连接件通过一个或多个把手部件中的孔以及一个或多个面向把手的轭的那部分中的孔而连接到轭。最好，把手部件或轭，或两者，具有多个孔，从而，通过配合把手部件中的一个孔到把手部件将面对的轭的那部分，把手能够沿轭上下再定位。把手组件可包括，例如，弯曲的或方形的/正方形的/U 形的并在一端是开口的、以及配合轭的每一个侧面的一部分的一个片件。

在一个实施例中，包括把手的轭的长度大约是 6 至 7.5 英尺，或者是大约 6.5 至 7 英尺，从轮子下面的平面开始的把手的高度大约是 40 英寸至大约 52 英寸。该实施例中的把手宽度大约是 21 至大约 26 英寸，或者大约 23 至 24 英寸。

本发明的另一个实施例包括一种利用一种装置进行除雪的方法，该装置包括基本上在操作者的腰的高度的比较大的轮子。U 形轭在一个闭合端具有把手，在一个开口端具有铲板，并且该轭安装到轮子的轴上。该方法需要有操作者，其通过推动把手并以把手控制的方向转

动轮子，从而沿路径移动该装置。操作者沿该装置的路径将材料装料铲到铲板上。在拾取材料装料之后，操作者下压把手，以提举铲板到能离开路径的高度；进一步调节铲板的高度，以相对于轮子的轴并在轮子的轴上方获得装料平衡；传输该平衡的材料装料到目的地；并在目的地，轻快的施加身体重量到把手上，以将材料装料推出到离该装置相当远的距离。

附图说明

图 1 是本发明的装置的三维实施例，示出一个结合到呈轭架的形状的驱动部件上的比较大的轮子，根据本发明，该轭在一端具有一个把手，在另一端具有一个铲板，以通用于拾取、传输并处置材料，特别是雪。

图 2 是图 1 的装置的顶视图，示出根据本发明的铲和轭内的轮子的定位。

图 3 示出图 2 的装置的侧视图，示出根据本发明的该装置的把手的可调整性的一个方面。

图 4 是图 3 的装置的示意图，示出本发明的装置的部件的多种尺寸关系。

图 5 是图 3 的装置的另一个示意图，示出根据本发明，施加到该装置的辐条上的多种力。

图 6 是本发明的一个实施例的示意图，示出具有一个“S 形”中间部分和把手的轭，该轭是可旋转的并可滑动延伸。

图 7 是本发明的一个方面的示意图，根据本发明，包括弹簧以协助将材料从铲板推出。

图 8 是本发明的一个实施例的一个方面的示意图，示出，根据本发明，采用铲板轮以便于铲板在粗糙的地面上，比如碎石表面上移动。

图 9 示出一种可调把手部件的顶视图。

图 10 示出包括一个能在 360° 范围内旋转的可调把手元件的把手部件。

图 11 示出一种在中间部分具有可调凹口部件的示例性轭的侧视图。

图 12 示出具有弧形壁的铲板的顶视图。

图 13 示出一种成角度的铲板的侧切图。

图 14 示出一种铲板 - 钜连接件的顶视图，其具有连接轭的两个部件的连接板。

图 15 示出一种铲板 - 钜连接件的顶视图，其具有连接轭的两个部件的成角度的连接板。

图 16 示出图 15 的具有成角度的连接板的铲板 - 钜连接件的侧切图。

图 17 示出一种可调把手部件实施例的透视图。

图 18 示出另一种可调把手部件实施例的透视图。

具体实施方式

现在参照附图，图 1-8，这些图示出了本发明的实施例，包括以一种有效的方式拾取、传输并处置材料。

图 1 中的参考标记 10 统指一种代表本发明的一个实施例的装置，包括轮组件 100、驱动部件 110，驱动部件基本上模仿一个 U 形的轭，该轭在其闭合端具有一个把手 133 以及一个铲板 120 连接到其敞开端，其中轭安装到轮子的轴 190 上。轮子和铲板以铲板在正常位置停留在地面上的方式结合到驱动部件上。操作者使用把手通过在地面上转动轮子而以任何方向移动该铲。操作者还利用把手来引导铲子将位于其路径上的材料推入到铲板上。然后操作者提升铲板离开地面以拾取一铲材料，接着以舒服的行走姿势进一步提升铲板以平衡装料。在目的地，操作者利用快速向下的身体（或手臂）运动压把手，以将装料送出铲子。操作者能够通过沿该装置运动的方向操纵铲子而将材料直线向前送出，或者通过侧面抛抖铲子而将材料侧面送出。

本领域技术人员以及雪铲的普通用户将理解，图 1 所示的大轮子（在下面将进一步定义，并在图 3 中相对于人的尺寸大小而描述）使

得用户能够将雪和铲板提升到未铲动的雪的高度之上，并在其上和粗糙表面上移动，而不会挤压要跨越的未铲动的区域。铲子的比较高的水平高度的把手使得用户能够在向下推动把手时舒服的将雪的装料向前加速而离开铲板，这增强了雪的轨迹的抛掷距离。

轮组件 100、驱动部件 110 以及铲子 120 都按照人体工程学原理形成，以有助于对操作者的身体产生最小的压力、尤其是可防止后背应力或伤害，而拾取并卸除基本上沿运动方向对准的一堆比如沙子、碎石块或雪的材料 160。在本发明的一个实施例中，后面将更加详细的说明，从该装置的支轴区域对该装置的操作者的动作提供一种回弹助力，从而以一种轻快的有效的方式卸除材料。当轮子是静止的时候，材料也能被拾取和卸除。以及，当轮子是静止的或运动的时候，材料能根据需要向前或向侧面，被抛掷式的卸除或被推出。

在图 1 所示的本发明的一个实施例中，驱动部件 110 最好由连续的金属管制成，其被成形为在上部 130 具有一个把手 133，在中间部分 140 具有一个支轴 (fulcrum) 支承区 145，在下部 150 具有一个敞开结构 155 以接收铲板 120。把手 133 在 115 处是可延伸的，以获取长度、高度和杠杆作用可调性，这在后面的本发明的多个实施例中都将详细说明。同样在图 1 中示出的支轴支承区 145 包括一个位于驱动部件中间部分 140 的开口，它最好能接收一个滚柱轴承 (未示出)。轮组件 100 的轴 190 的一部分 195 配合到驱动部件的支轴支承区 145 内部。145 处的连接点被设计成能重构铲子，以适合用户高度、力量和雪况。能沿驱动部件的中间部分滑动的连接附件能用于调整把手的高度以利于杠杆作用，同时便于装置的操作。下面，将参照用于以轻快的、以及人体工程学上讲有益的方式从铲子处理材料的支轴和把手以及铲子的关系，更加详细的说明支轴及其连接附件的功能方面。

在图 1 所示的实施例的一个方面中，驱动部件 110 形成为细长的 U 形，模仿一个轭，具有提供了把手 133 的上部，在狭窄的中间部分 140 具有远侧面以容纳轮组件 100 的轴 125。U 形驱动部件 110 的相对较长的腿 (大致包含中间部分 140) 之间的距离由支柱 117、119 和 157

决定，这些支柱合理地形成在两个腿之间，以使得轴配合到支轴支承区 145 中。本领域技术人员会知晓，任何数量的不同方法都能用来连接轮子的轴到形成支轴区 145 的开口中。例如，可以采用熟知的自行车轮的快速卸除方式。或者，通过轻微的掰开 U 形驱动部件的腿 140，具有带轴肩（未示出）的突出部 195 的管子形式的轴，能咬合配合到开口 145 中。这些轮安装特性在本领域是公知的，由于它们对于本发明而言并不重要，所以，它们在此并没有详细描述，以避免不必要的使本发明难理解。优选的是，用于驱动部件 110 的管材包括中空的铝，或其它金属管。也可以使用非金属材料，比如塑料。

在本发明的一个实施例的另一个方面中，轮组件 100 包括一个轮子 170、轮辋 175 以及辐条 180，辐条连接轴 190 到轮辋 175，如图 1 和图 2 的顶视图所示。也可以采用不同类型的轮子，包括不同的轮面、宽度或连接轴到轮辋的连续的辐板。例如图 1 所示的相对较窄的轮子具有不会向下将雪压实的优点，例如，当铲雪时。轮子 170 的尺寸和把手 133 相对于轮子的轴 190 的位置，基本上是参照人体的手臂的位置来确定的。把手 133 相对于总的人体姿势的相对位置如图 3 所示。

在图 4 所示的本发明的一个实施例的另一个方面中，优选的是，轮子直径 a 在大约 30 到 36 英寸之间，而把手 110 从直接位于轮子下方的基准面开始的高度，也就是，从地面基准 x' 开始的高度在大约 48 到 60 英寸之间。从轴 195 的中心开始的把手 133 的高度优选在大约 26 到 42 英寸之间。在本发明的另一个方面中，通过一种叠伸缩装置 115，比如图 3 所示的在内管上的一个滑动中空外管，可提供把手高度的进一步调整，这确保了更优越的人体工程学舒适度。轮式铲的整个长度 d 在大约 78 到 88 英寸之间。从铲板 120 的末梢到轮组件 100 的中心附近的支轴区域 145 的距离 e 在大约 32 到 42 英寸之间。如图 4 所示，从支轴区域到把手末梢之间的距离 f 能根据操作者所选择的位置而改变。例如，能够调整距离 f ，以使得更易拾取和提举装料，更均匀的平衡该装置上的装料，以利于传输该装料到某个地方，和/或在需要的位置在铲子上拾取装料时获得更高的杠杆效率。

因此，本领域技术人员将知道，轮子的较大直径、铲子的整体长度以及从地面开始的铲子把手的高度之间的关系决定了铲雪的轻松程度。把手的齐腰高度位置有助于推动被铲的堆积雪或其它材料。轭的长度和把手高度之间的比值大于 1:1 将利于把手被放低时提举满铲板的雪。该杠杆比率能通过改变轭连接到轴的点的位置而改变。以及，不同形状的轭，如图 4 和 5 所示，将不同的有助于提高铲子的效率。一种优选的“S 形”轭在图 6 中示出，在下面的本发明的优选实施例中将详细描述。

除了该人体工程学优点，本发明的实施例还通过巧妙的利用如图 5 所示的形成在轮组件的中心部分的支轴线而提供更强的性能。线 x' 经过支轴区域 145 的中心，平行于地面基准线 x ，以形成该支轴线。经把手 133 上的作用而施加到支轴的力 F 能分解成水平分量 F_h 和向下的竖直分量 F_v ，如图 5 所示。由于对于水平分量 F_h 基本上没有阻力，根据如图 5 所示的所施加的力 F 的方向，该轮子转向左边，而轮子下的地面反作用于向下的分量 F_v ，通过轮子产生一个向上的反作用力 $-F_v$ 。例如利用手臂和/或身体重量，施加一个轻快的几乎全部向下的作用到把手上，这对于抛力产生一个回弹助力。该分力矢量的值由基本上通过角度 θ 的传递力 F 的角度 β 来决定。角度 Ω 有助于抛力。以及，铲板能以不同的构形形成，以助于材料 160 从铲子上有效的卸除。例如，铲板能具有一个底部，该底部具有一个相对较大的曲率半径 ρ ，模仿一个勺子，以利于材料从铲子滑动，还用于防止材料向后滑动并从铲子中洒出。本领域技术人员将理解，这些多种参数可设置成符合本发明的装置的人体工程学和满足功能性需求的值。

图 12 示出铲板 245，其具有装料承载内表面 260，该内表面具有弧形壁 250，并且侧壁成锥形并几乎在铲板 245 的导缘 255 附近终止（两侧的壁都是锥形）。在图 13 所示的优选实施例中，铲板 245 在侧面 265 成弧形，从而形成上下部分之间的角度。

图 6 示出本发明的优选实施例，在一些视图中，类似部件采用类似的字符和标记。图 6 所示的轭的侧面视图具有一个上部 130、中间

部分 140 以及下部 150。轭在一个可滑动套 143 的凹口 O 中的轴 195 (未示出) 处连接到轮子 170 (虚线示出) 上。套 143 能在轭的部分 150 上 (沿该图中所示的任一个箭头所指的方向) 滑动, 以改变支轴 145 的位置、有效杠杆长度 f 以及“抛臂”e。通过向下推压把手 133 到虚线位置 133', 完成抛甩动作。预备的参考标记, 也就是, 130', 135', 140', 150' 和 120', 示出了在轭 110 的把手向下运动之后的轭 110 的其它部件, 包括铲板。本领域技术人员将理解, 多种不同的机械结构能被用于调整支轴点 (支点), 以实现将装料抛掷出铲子所需的杠杆力。

在图 11 中, 示出轭或驱动部件 110 的侧视图, 其具有一个可调长度的带凹口的元件 205, 例如一个杆, 在中间部分具有一个或多个凹口 210, 从而可允许支轴点被改变而不用改变 (或减小对于实现同一施加力:转移的装料的比值所必需的在位于轮子底部处的平面上方的把手高度的改变量) 中间部分上方的轭部分的长度和/或改变中间部分下方的轭部分的长度。凹口可以是多种形状, 比如长方形、正方形、圆形或角形。角形槽是优选的, 因为它们会减小轮子相对于带凹口的元件的倾斜度, 从而获得更好的稳固度。

通过改变与轴 (也就是, 位于凹口中的轴) 相联的凹口 210, 杠杆作用效率会改变, 即使轭 110 的结构、高度和/或长度都不改变。带凹口的元件 205 还可进一步构造, 以使得在这些凹口当中沿该元件重构能改变铲板相对于地面的角度, 比如从形状 215 改变到形状 220。减小铲板接触地面时的角度会减小摩擦力。在该实施例中, 示出了一个具有把手部分 133 的轭 110, 一个具有上弯部 225 的“S 弯曲形”中间部分, 一个下弯部 230, 一个中间弯部 235, 一个直线部分 240, 以及形状 215 和形状 220 的铲板部分。图 11b 和 11c 示出其它可采用的带凹口的元件 205 的实施例 (仅示出轭 110 的一部分)。图 11b 的带凹口的元件 205 示出角形凹口 210', 凹口 210' 使得当轭 110 来回运动时对轭 110 到轴的固定进行改进。图 11c 的带凹口的元件 205 包括孔形的开口 210''。通过孔的连接在轭 110 来回运动时能进一步增强轭 110 固

定到轴。

本发明的一个实施例的一个方面包括一个形成图 6 所示的铲的中间部分 140 的“S 弯曲形”部分。该大致为“S 弯曲”（包括在弯曲的中间部分的基本成直线的部分）是一体的，以最优化“传动”/杠杆作用，从而增强铲板加速以及将装料从铲子更快、更高和更远的抛出。该“S”形被形成为具有对着角 Φ 的下部弯曲。“S 弯曲”的下部的角度 Φ 和上部的角度 Φ' ，如图 6 所示，最好都在大约 80° 到 90° 之间，虽然其它角度也可以使用。在一个实施例（未示出）中，利用未预料到的杠杆性能，内角 Φ' 在大约 80° 到大约 120° 之间，或更优的在大约 80° 到大约 100° 之间，以及在大约 80° 到大约 90° 之间，而角度 Φ 在大约 110° 到大约 165° 之间，或大约 120° 到大约 155° 之间。在这些情况下，下角与上角使顶部把手部分能相对直和水平一些。例如，通过实现一个直线部分，其便于把手长度延伸而不必大大改变把手高度，相比于其它结构，这种结构增强了性能。相比于其它结构，它还可允许用户施加更大的力量而不会过度增加铲子和地面的摩擦。回到图 6，当把手 133 被放低时，“S 弯曲”的下部的弯部经弧线 Σ_1 和 Σ_2 而移动距离 A，如同一图 6 所示。S 弯曲的直线部分经过了弧线 Δ_1 和 Δ_2 。当把手被放低时，“S 弯曲”开始向下移动，因此把手仅需要被放低到等于 T 的量，从而提举铲板 120 到高度 M，位于新位置 $120'$ 。本发明的一个方面是，当中间部分 140 靠近支轴区域 145 定位时，A 的数值和杠杆比值 M/T（铲板提升高度和把手位移的比值）也相应改变，其中中间部分 140 包括该“S 弯曲”，包括直线部分。优选的是，“S 弯曲”的直线部分的长度 H 大于 A，从而在把手运动的整个范围内，当铲板被提升或放低时，所需的杠杆作用（基于轴连接点）或“传动”得以保持。因此，为达到最优操作（也就是，舒服的操作，不需要铲子的操作者弯曲），最好是，把手的最大位移为 T， $T > H > A$ ， $\Delta_1 \approx \Delta_2$ ，并且 $\Sigma_1 \approx \Sigma_2$ 。

在本发明的另一个方面，图 6 所示的把手部分 133 具有柄部（shank）134，其可滑动和可旋转的配合到中空套部分 135 内部。把手 133 能被拉出、推入和/或旋转，以在铲动、拾取和从铲子抛出装料

时找到最符合人体工程学的位置。通过利用相对于中空套 135 的内表面的摩擦保持力，柄部 134 能沿套 135 滑到任何一个连续位置。然而，插销 137 是优选的，其沿套部分 135 的长度方向巧妙的定位，用于接合孔 139。沿把手 133 的长度 E 在大约 12 到 18 英寸之间，而沿套部分 135 的长度 L 在大约 16 到 24 英寸之间，虽然还可以采用其它长度。铲子装置的整体长度 d 能增加 Δ_d ，最好在大约 6 到 12 英寸之间，而整体高度 c 能增加 Δ_c ，最好在 4 到 8 英寸之间，从而，使得整体长度 G 在大约 89 到 100 英寸之间，而整体高度 I 在大约 42 到 66 英寸之间。利用这里采用的优选尺寸，能非常轻松的将铲板提升到大约 36 到 44 英寸的高度。

图 9 示出把手组件 275，其中“U 形”把手杆 280 容纳于横套 290 的中间部分内，该横套由两个支承杆 300, 300' 支承。“U 形”把手杆 280 示出为可在横套 290 内移动，该横套 290 包括一个圆管形套。把手杆 280 也示出为包括手柄 305, 305'。

图 10 示出把手组件 275'，其中该组件包括插入到开口管形把手 315, 315' (315, 315' 示出把手部件的两种结构) 中的可调把手部件 310, 310'，这种把手部件提供和开口管形把手 315, 315' 的内壁的摩擦，并允许可调把手部件在 315, 315' 内滑动以允许 360° 运动。把手部件 315, 315' 因美观因素和/或易于握持的因素而可用外罩覆盖。

图 17 (A) 示出把手组件实施例 350 的透视图。这些实施例包括一个连接板 355，例如该连接板可焊接或以一些其它方式连接到轭 387。连接板 355 包括多个连接通道 360，在图示中示出为孔，其定位为对应于连接通道 360'，也在图示中示出为孔，相关于把手 370。把手 370 示出为包括水平杆 375，其在结构上可为管形的，固定道弯折板部分 380，该弯折板具有一个包括连接通道 360' 的下部。通过固定装置，比如螺钉，该通道 360' 能连接到连接板 355 中的相应通道 360。把手 370 的弯折板部分 380 的弯折，使得把手可被翻转并向下安装到上侧，以改变把手高度，不同的连接通道允许把手高度可被设置成不同的高度。图 17 (B) 示出把手部件的另一个实施例，其中轭的末端

包括一个扩大开口连接端 387 和一个开口端 386，扩大开口连接端 387 具有一个带有连接通道 360（示出为孔）的顶部连接板 355'，一个相对于所述顶部连接板 355' 的底部板（未示出）（底部板也最好构造成带有连接通道的连接板），而开口端 386 允许把手 370 的弯折部分配合到顶部连接板 355' 和底部板之间。顶部连接板 355'、把手 370 的弯折部分以及底部连接板（未示出）中的一个或多个、最好是所有的连接通道被优选的匹配，以允许固定装置 385，比如螺钉，通过每一个通道。固定装置 385 可通过其它连接件比如螺母 362 而锁定该连接。

图 18 示出另一种可调把手组件实施例 390 的透视图。这个实施例也包括把手 370，其包括一个固定到弯折板部分 380 的水平杆 375，该弯折板具有一个包括连接通道 360' 的下部。相比于图 17 中的实施例，不同于连接板 355（图 17），对应的通道 360 位于轭本身 387。通过固定装置 385，比如螺钉，通道 360' 能连接到相应的轭 387 中的通道 360。此外，能通过有槽部分实现把手 370 到轭 387 的这种连接，从而它们可彼此连接而不需要一个固定装置，而且仍然会很牢固（未示出）。

本发明的另一个方面中，多个弹簧 200（在图 7 中仅示出一个）被用于，当轮子 170 的轮胎不像例如具有一个充气管的自行车轮胎那样具有柔性时，在支轴线处提供一个增强的反作用力。在图 7 中，轴 190 用于接收位于轴的两端 195 中的每一端上的一个弹簧，该轴的两端作为支轴，并传输来源于施加到轴上的作用产生的回弹反作用到铲板上。

在本发明的另一个方面，滚轮 210 连接到铲板 120 的底部，以便于越过粗糙的地表面，比如碎石路，如图 8 所示。对于本领域技术人员而言很明显的是，该滚轮可减小和地表面之间的摩擦，尤其是当更多的装料堆积在铲子上时，而铲子被前推以从地表面拾取更多的材料，比如雪。在图 6 中采用类似的附图标记表示了类似的滚轮，其中预备标记对应于铲子 120 被提升时的滚轮位置。如图 6 所示，滚轮连接到的铲子具有一个在大约 15 到 18 英寸之间的侧面尺寸 P。

图 14-15 示出一种铲板 - 铲连接组件 320。该连接组件包括轭铲

板连接端 330, 330', 以及连接板 325, 该连接板具有多个连接部分 335, 如图中所示, 具有多个固定装置比如螺纹穿通的孔。连接到铲板的该连接可以或可以不需要有铲板的元件或装料表面。在图 15 中, 示出一种优选的连接板 325, 其具有水平面部分 340 以及角形平面部分 345。一个内角可在大约 120° 到大约 170° 之间, 或大约 130° 到大约 150° 之间。该角度有助于抑制板的弯折。当角形平面部分 345 没有固定到铲板时, 其允许铲板的弯曲和回弹, 这有助于装料的装载和卸载。图 16 示出这种角形板的横截面图。

图 1-14 示出的本发明的实施例适用于以有用的方式实现不同的增强和改进。例如, 铲板可利用更柔性的材料制成, 以增强抛甩铲子装料的能力。当铲板加速卸载和装载时, 铲板的柔性能在铲板从弯折形状折回到初始位置时获得一种蹦弹效果。通过利用一种弹簧加载的铰链(未示出)连接铲板到铲子轭, 可获得一种可比效果, 其中弹簧加载铰链增强了轮式铲的抛掷能力。以及, 铲板 120 如图 3 所示固定到侧壁 125, 从而能够拾取或保持比如雪泥的液状物质。在另一个方面, 安装有轭的驱动部件可在支轴区域弯折, 以利于传输该装置, 其中一个快速释放轮安装到支轴区域并可容易的从支轴区域去除。作为一个可选例, 驱动部件包括两个等分部件(未示出), 其在图 1 的支轴区域 145 彼此连接。也可以理解的是, 可使用多种宽度的多个轮来替代本发明的图 1-8 所示的一个轮子。以及, 该装置能被电动化, 以从本发明的轮式铲拾取、传输和推出材料装料。还有, 能利用电动机能量来存储能量到弹簧或其它能量存储装置中, 该弹簧或其它能量存储装置转而能用于协助在铲子上推动和/或抛掷装料。

虽然这里阐述了所公开的装置和方法的许多细节, 比如多种尺寸大小, 以帮助理解本发明, 然而, 对于本领域技术人员而言, 可以不采用这些具体细节来实现本发明是显而易见的。也就是, 虽然本发明已经参照实施例被具体的示出和描述, 但是本领域技术人员能够理解, 进行形式和细节上的多种改变不会脱离本发明的精神和范围。

说 明 书 附 图

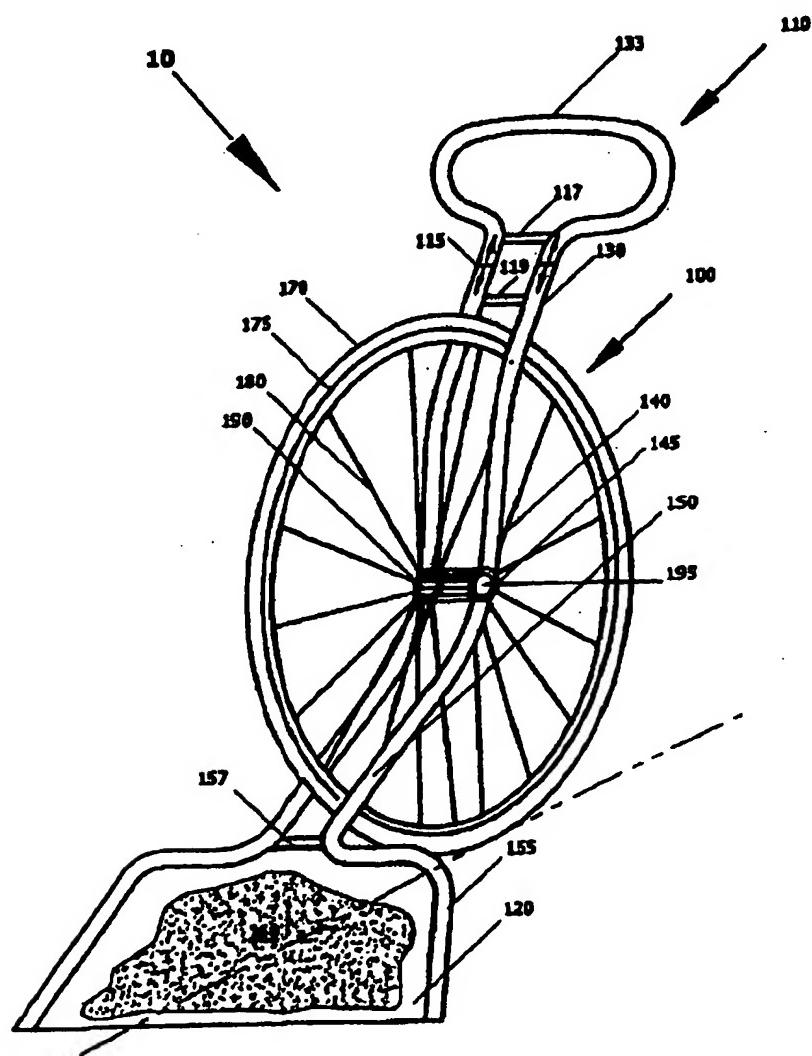


图 1

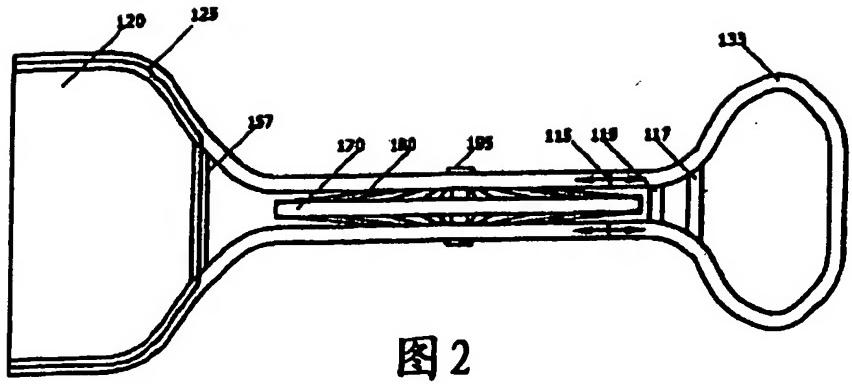


图 2

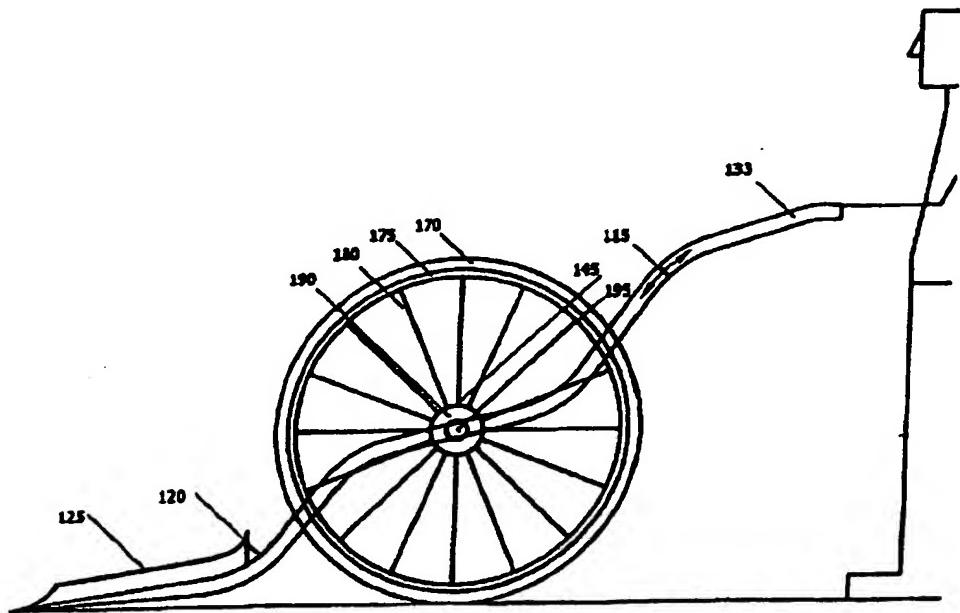


图 3

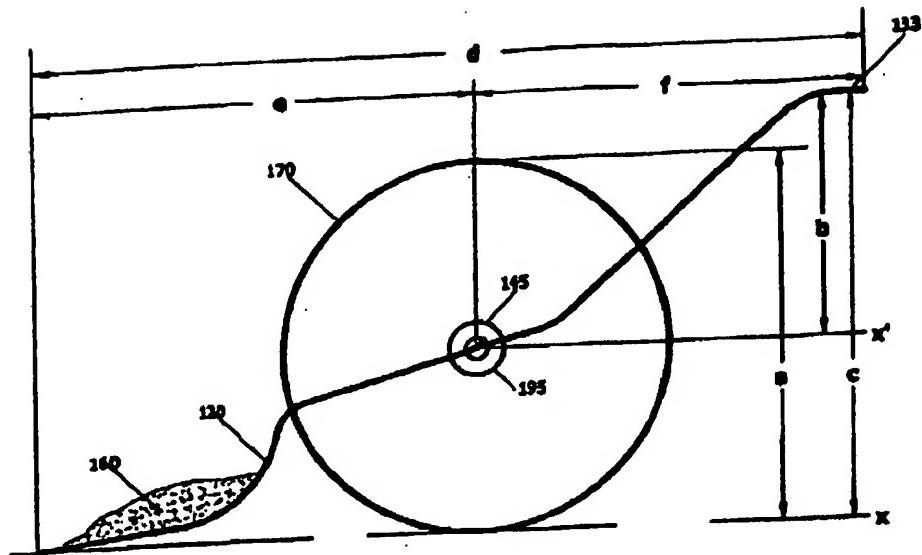


图 4

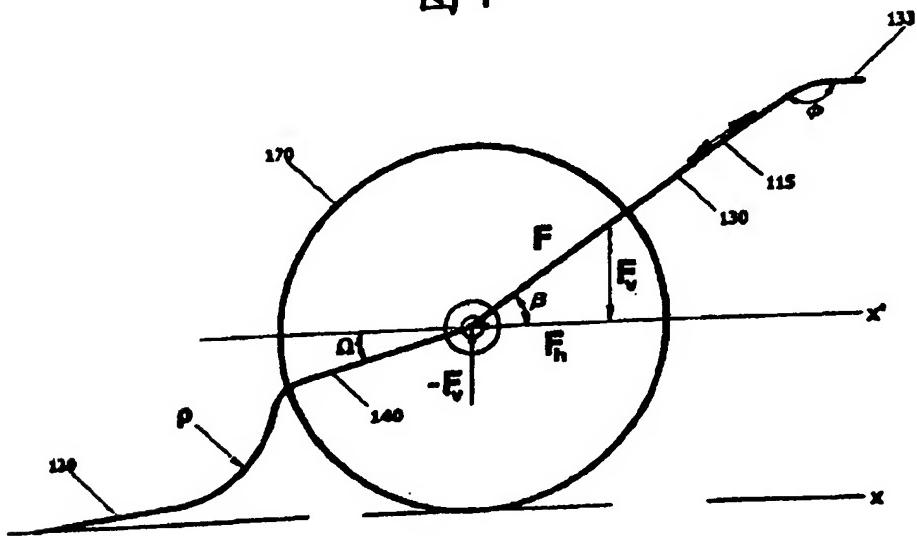
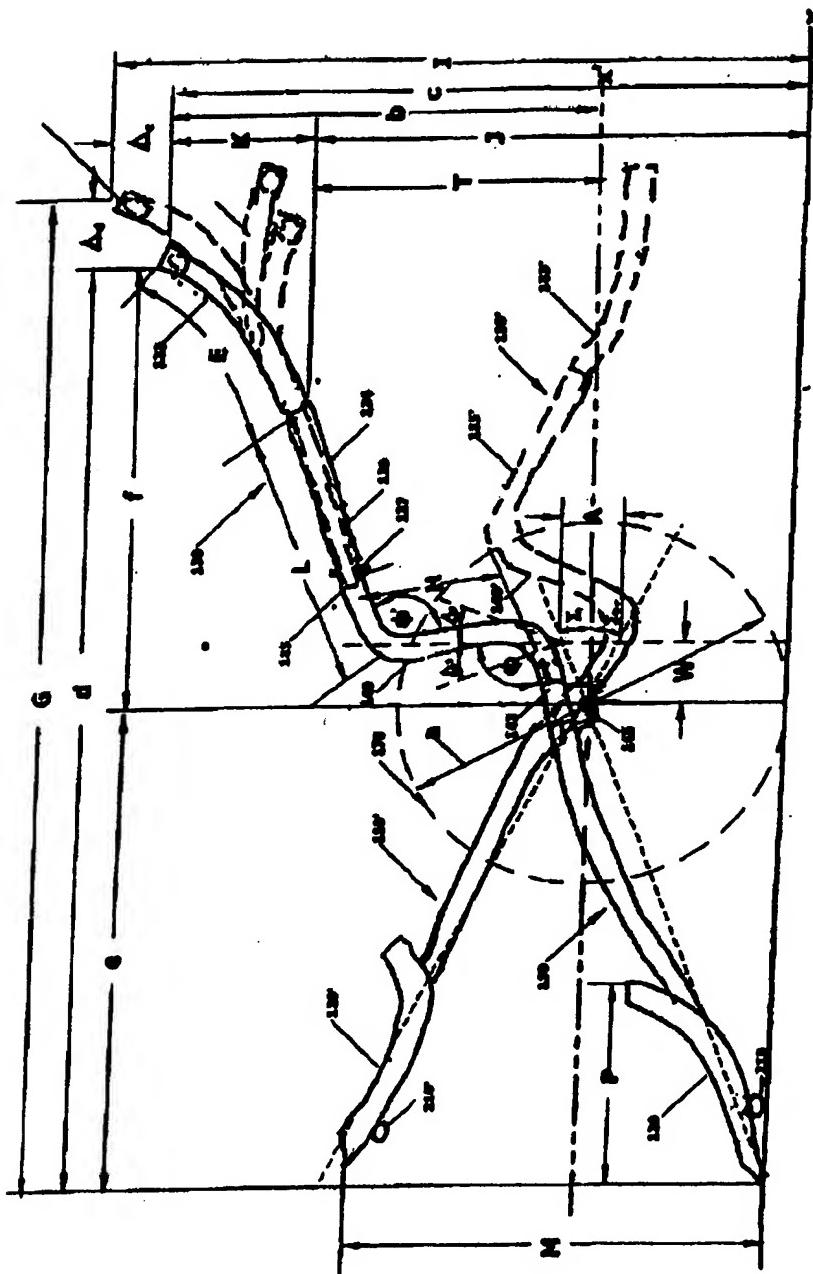


图 5

图 6



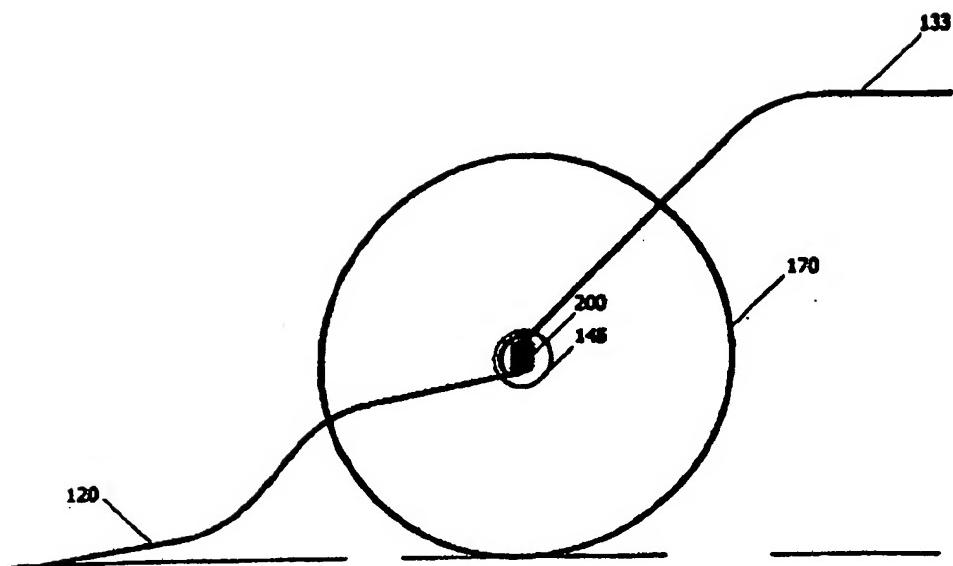


图 7

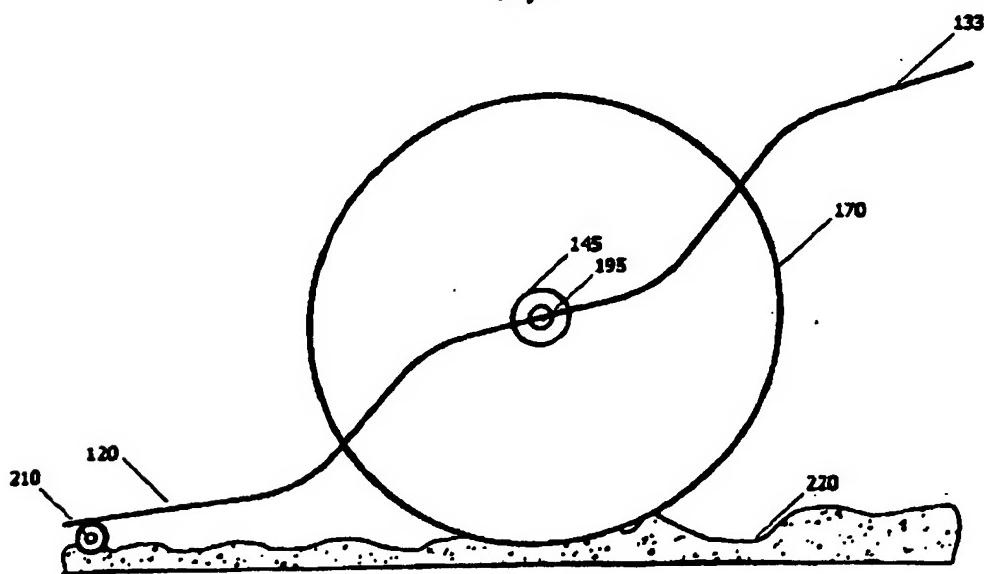


图 8

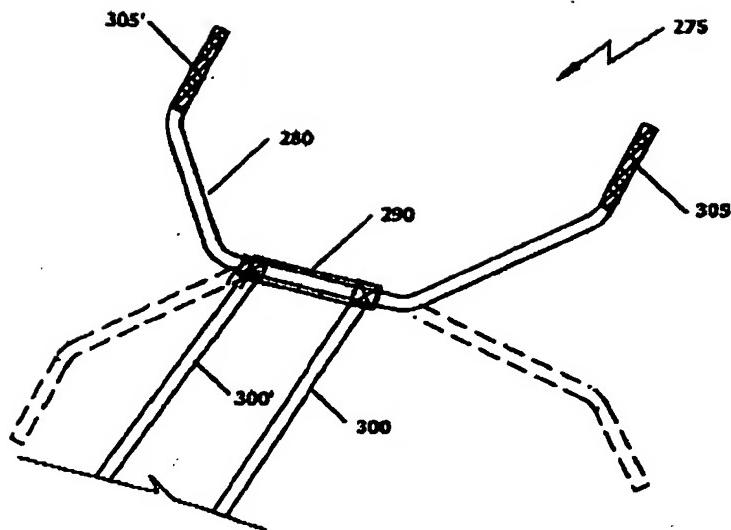


图9

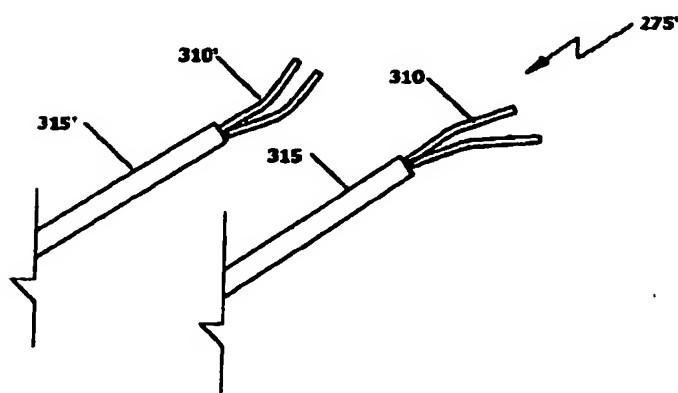


图10

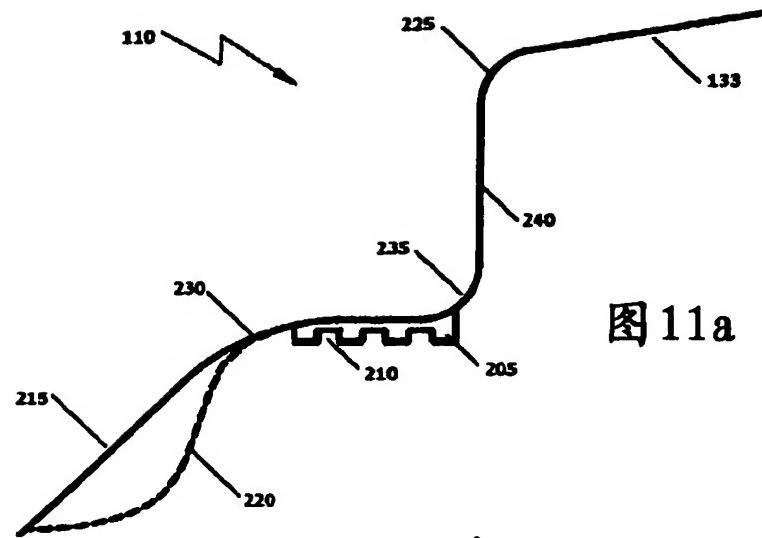


图 11a

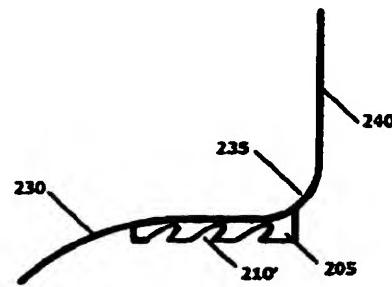


图 11b

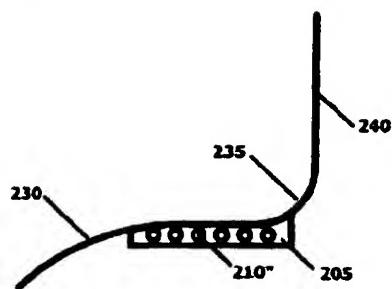


图 11c

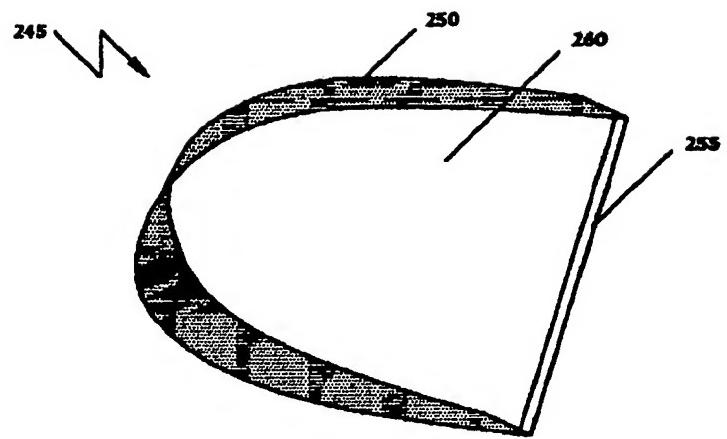


图 12

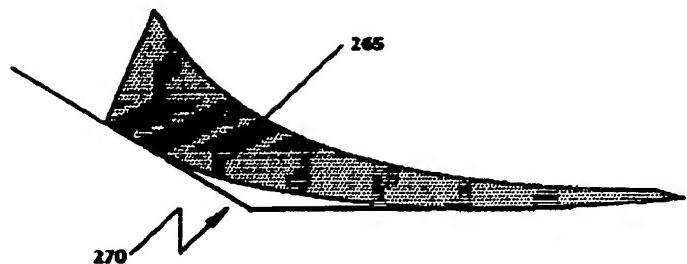


图 13

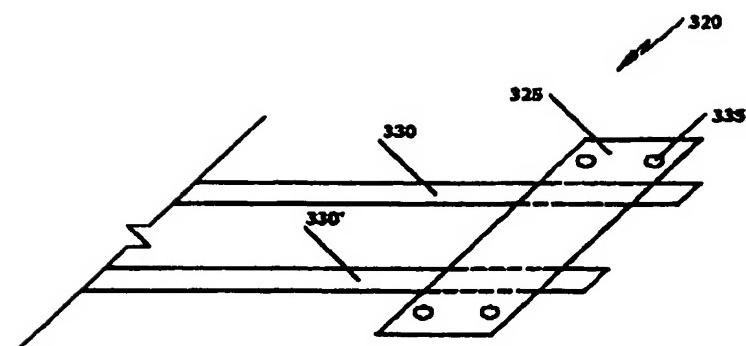


图 14

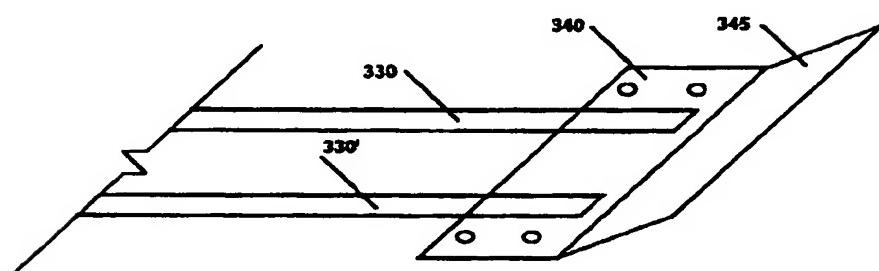


图 15

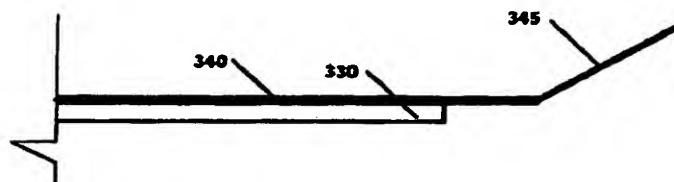


图 16

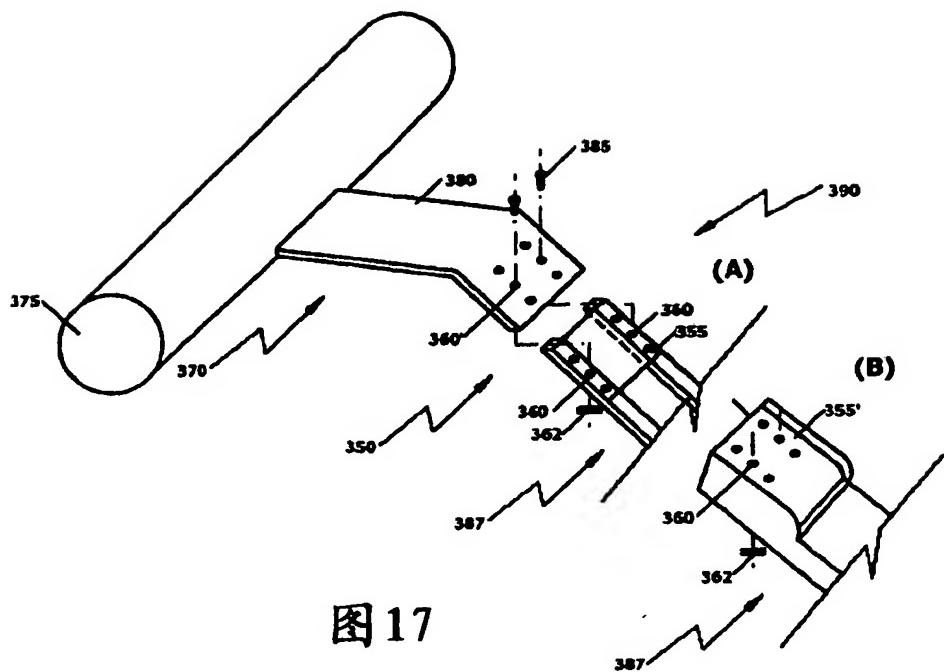


图 17

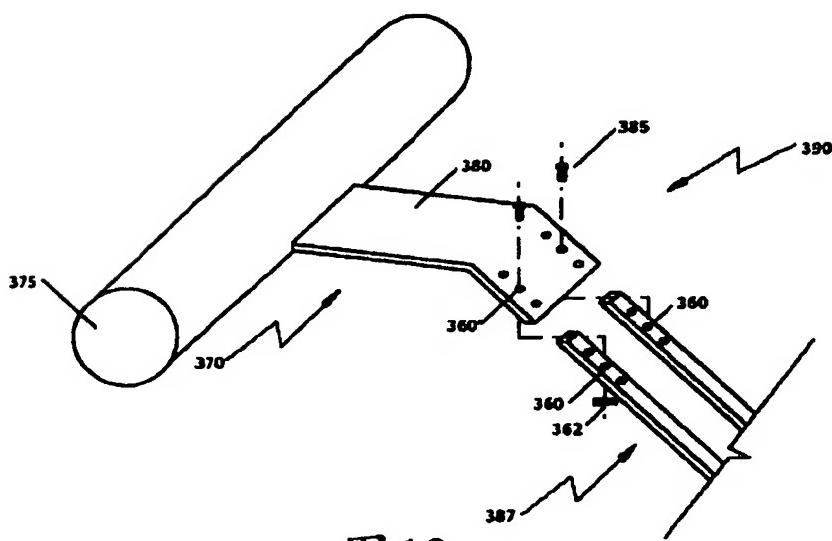


图 18

WHEELED SHOVEL

FIELD OF INVENTION

[0001] The invention relates generally to manual wheeled vehicles for moving and disposing materials. More particularly, the present invention relates to a snow removal shovel on a wheel which provides a recoil action to assist in propelling the snow.

BACKGROUND OF INVENTION

[0002] Numerous manual wheeled vehicles have been in use to assist in transporting materials from one place to another. Age old wheelbarrow is, of course, well known. However, aside from transporting alone, loading onto and unloading of materials from a vehicle easily and with minimum stress and strain to the human body have required different approaches. This has been true for shoveling or plowing snow, including wet and heavy slushy snow.

[0003] In US Patent 5,918,921, Samuelson shows a levered shovel for moving snow. The shovel includes a blade for carrying the snow, a shaft that extends from the blade, a wheel assembly for contacting a horizontal surface and which depends from the shaft, and a handle assembly for gripping by the user and which is disposed on the rearmost end of the shaft. The wheel assembly comprises either an axle fork, an axle rotatively mounted to the axle fork, and a pair of wheels attached to the axle or an inverted T-shaped member with its transverse portion serving as its axle to which a pair of wheel are rotatively attached. The handle assembly comprises a lower transverse member for gripping by the hands of the user and extends laterally from both sides of the rearmost end of the shaft and an extender for elevating the point at which the user grips the handle assembly for users with limited bending posture.

[0004] Jurkowski, et al., disclose a wheeled snow shoveling device in US Patent 5,511,327. The shoveling device comprises a cart having a handle formed in a generally A-shaped configuration with a cross bar including a circular ring extending therefrom. The cart includes a wheel with an axle positioned at its axis, the wheel including a pair of vertical support bars affixed to the axle, the wheel also including a pair of horizontal braces affixed to its axle. The lower segment of the handle is coupled to the braces. A snow shovel has a blade formed as a generally rectangular shaped member and is molded into a semi circular configuration, the rear surface of the blade being coupled to the free ends of the horizontal braces of the cart wheel. The blade has a wooden shaft affixed to its rear surface, the shaft extending through the circular ring on the cross bar of the handle, the free ends of the vertical support bars being coupled to the shaft.

[0005] In another approach for removal of snow, Petruzzelli discloses in US Patent 6,675,507 an articulated shovel blade for pivoting movement relative to a wheeled carriage on which the blade is mounted. The shovel blade is adjustably locked in position at different angles relative to the direction of travel of the carriage, for pushing snow or other material to the side of the shovel as it travels across the ground. The carriage is pushed forward using a handle or a motor is provided for self-propelling the carriage.

[0006] In still another approach, Lobato describes in US Patent 5,581,915 a snowplow carriage assembly for removal of snow manually by plowing the snow in an area to be cleared of snow. The carriage is a manually propelled wheeled structure made of a plurality of members pivotally connected for collapsing and folding for storage and unfolding for use in supporting and transporting a snowplow in the form of a replaceable conventional snow shovel having a handle straight length portion. The carriage is configured so that the snow shovel handle is removably mounted thereon inclined from the horizontal defining an acute angle relative to a surface on which snow is being plowed. The snow shovel inclination is variable for establishing different acute angles of the shovel relative to the surface for plowing the snow thereon and removal therefrom.

[0007] In US Patent 6,643,958, Krejci discloses a snow throwing shovel device for removing snow from narrow sidewalks and from steps where a conventional snow blower cannot be used. The snow throwing shovel device includes

a scoop assembly including a housing having top, bottom, side, and back walls, and also having an open front. The shovel also includes an elongate chute attached to the scoop through which snow is moved. The shovel further includes a discharge spout rotatably mounted to the elongate chute, handle members attached to the elongate chute; and an assembly for picking up snow and moving snow through the elongate chute.

[0008] The present state of prior art, thus, generally provides two types of shovels which are particularly common. One type involves lifting and throwing of the snow, and the other involves pushing of the snow like plowing. These cited prior art references are incorporated by reference in their entirety. What is needed is a combination of the two types of snow shovels where the plowing type of action can be incorporated into a shovel which also lifts and throws the snow with ease and with least ergonomical discomfort.

SUMMARY OF INVENTION

[0009] The present invention involves a wheeled shovel having a handle formed at the end of an elongate yoke, the yoke being mounted, near its middle portion, onto the axle of a relatively large wheel for the purposes of picking up of a load, transporting it to a destination, and propelling the load overboard with a quick body (or arm) motion on the part of a person operating the handle. The substantially waist-high wheel is adapted to receive the body force of an operator as an effective leverage through the handle and cause a recoil action from the wheel to enhance the throwing power of the apparatus of the invention, comprising the shovel, the wheel and the yoke as the driving member.

[0010] An embodiment of the present invention involves an apparatus for removing and disposing materials. The apparatus comprises a wheel assembly having a rim and an axle connected together with spokes radially projecting from the axle. The axle includes a fulcrum member capable of transmitting a recoil reaction to an action. A driving member has an upper portion, a middle portion and a lower portion. The middle portion is generally "S-shaped" and is attached to the fulcrum member of the axle. A handle is attached to the upper portion of the driving member and is capable of moving the wheel assembly. A blade is attached to the lower portion of the driving member, the blade being adapted to pick up a load of

material from a surface when the blade is lowered to the surface by raising the handle and pushing forward. When the handle is pushed downwards, the downward action causes the wheel to compress and recoil through the fulcrum member at the axle of the wheel. As a result, the blade springs upwards and forwards, thereby propelling the load of material briskly away from the apparatus

[0011] An aspect of the embodiment of the present invention comprises a wheel assembly having a rim and an axle, the axle further comprising a tubular body having two ends adapted to receive spokes which connect the axle to the rim. The axle further is adapted to receive a plurality of springs at the two respective ends of the axle to act as a fulcrum, and transmit a recoil reaction to an action applied at the axle. An elongate U-shaped driving member has a curved upper portion, a generally straight middle portion and an open lower portion. The middle portion is attached to the springs at each end of the axle. A handle forms the upper portion of the driving member, and is capable of moving the wheel assembly. A shovel blade attaches to the lower portion of the driving member, the shovel blade adapted to pick up material from a surface when the blade is lowered to the surface by raising the handle and pushing forward. The blade springs upwards and forwards, thereby releasing the material briskly away from the apparatus when the handle is pushed downwards to cause the springs to compress and recoil through the fulcrum member at the axle of the wheel.

[0012] The shovel blade, when configured in a complete arc having tapered walls on the front leading edge of the shovel blade, has been found to provide better handling characteristics due to an even distribution of the load on the shovel blade when a load, such as snow, is trapped on the blade and the load is sprung from the blade. A rounded back wall allows more even distribution of the load in the shovel blade. For example, when the load enters on one side of the shovel blade, it deflects off the curved back and directs the load to the less full or empty side. More uniform distribution of weight makes throwing easier and requires less user force to prevent tipping of the device to one side. When a flat section is in the back wall of the shovel blade, it has been found to cause the shovel blade to be prone to not distribute the load as uniformly and to cause undesired imbalances due to uneven distribution of a load, such as snow, on the shovel blade.

[0013] In one embodiment, without limitation, the walls of the shovel blade may at its highest point reach about 2 to about 4 inches and taper down to next to nothing near the edge of the shovel blade leading edge and the leading edge of the shovel may have a width of up to about 28 inches, for example between about 20 to about 28 inches, and the shovel blade may have a length from front to back of about 14 to about 22 inches or about 16 to about 20 inches.

[0014] Handling may further be improved when the shovel blade itself is curved as seen from its side perspective. The shovel blade has also been found to work better in retrieving and dispensing material when it is angled with respect to the plane under the shovel blade between any angle of from about 15° to about 35°, or from about 20° to about 30°.

[0015] The shovel blade may comprise one or more projections, e.g., a fork or pitchfork configuration, on the front end of the shovel blade to allow for easier pickup of load material, such as mulch or soil. When the load is anticipated to be snow, the shovel blade may further comprise an ice chipper attachment that extends in front of the leading edge of the shovel blade. In such case, the chipper edge, not the shovel blade edge, may touch the ground, but still allow loosened iced or packed snow to enter onto the shovel. The shovel blade may also be equipped with a metal wear strip on the leading edge of the shovel blade, which strip may or may not be replaceable.

[0016] The shovel blade may be attached to the yoke by a number of different mechanisms. For example, the shovel blade may be attached by fitting tubes into slots within or on the shovel. It has been found that attachment through an attachment plate on the underside of the shovel blade (non-load carrying side of the shovel blade) adds to the stiffness of the shovel blade while allowing the edge of the shovel blade to flex when hitting hard objects such as packed snow or ice. The plate may have a bend in it to extend further forward (closer to the leading edge) under the shovel blade to support it better. Plates are preferred over tubes as giving greater clearance (of course, the tube could also be flattened near the ends). In an advantageous embodiment, the attachment plate attaches to the underside of the shovel blade at a point from about the middle of the shovel blade to about the leading edge of the shovel blade. For example, with a steel blade it has been found that the front end of an attachment plate located from about 2 to about 4 inches

from the leading edge of the blade may provide an unexpectedly advantageous lift/stress area without the need for increasing overall blade material thickness and stiffness. Such attachment plate, and its positioning, may also provide the ability to incorporate more curve in the shovel blade when viewing the blade from the sides, thereby incorporating strength. The edges preferably are more flexible.

[0017] The handle may be configured in a number of ways such as in a closed loop, open bar, dual handles, or straight bar. Hand grips on the handle may be used to improve grip on the device. A particularly useful bar is a curved bar with the curvature away from the machine (i.e., handles expanding out toward user).

[0018] In one embodiment, the handle is adjustable on the yoke such that the handle can be moved up or down. For example, the handle may be variably attached by use of movable bracket(s) or by sliding the handle portion into a portion of the yoke. In one embodiment, the handle is configured to comprise a moveable tube positioned within a gap of the yoke (e.g., collar) (for example, into a tube comprising a portion of the yoke) and can be slid in and out of the gap and rotated 360°, preferably affixed in its final position.

[0019] In another embodiment, the handle component is attached to the yoke via attachments through one or more holes in the handle component(s) and one or more holes in the yoke portion interfacing with the handle. Preferably one or both of the handle component or yoke has multiple holes such that the handle can be repositioned up or down along the yoke by matching one of the holes in the handle component to the yoke portion such handle component will interface. The handle assembly may comprise, for example, one piece that is curved or rectangular/square/U-shaped and is open at one end and that fits over a portion of each lateral side of the yoke.

[0020] In one embodiment, the length of the yoke including the handle is about 6 to about 7.5 feet, or about 6.5 to about 7 feet, and the height of the handle from a plane under the wheel is about 40 inches to about 52 inches. The width of the handles in such embodiment are about 21 to about a 26 inches, or about 23 to about 24 inches.

[0021] Another embodiment of the present invention involves a method of method of snow removal using an apparatus comprising a relatively large wheel substantially at the waist level of an operator. A U-shaped yoke has a handle at a

closed end, a shovel blade at an open end, and the yoke is mounted onto an axle of the wheel. The method involves an operator moving the apparatus along a path by pushing the handle and rolling the wheel in a direction commanded by the handle. The operator shoves onto the blade a load of material along the path of the apparatus. After picking up the load of material, the operator presses the handle downwards, to lift the shovel blade to a level that clears the path; adjusts further the level of the shovel blade to achieve a balanced load with respect to and over the axle of the wheel; transports the balanced load of material to a destination; and at destination, briskly applies body weight at the handle to propel the load of material to a substantial distance away from the apparatus.

BRIEF DESCRIPTION OF DRAWINGS

[0022] *Figure 1* is a three-dimensional embodiment of the apparatus of the present invention showing a relatively large wheel incorporated to a driving member in the shape of a yoke, the yoke having a handle at one end and a shovel blade at the other, for picking up, transporting and disposing materials in general, and snow in particular, according to the present invention.

[0023] *Figure 2* is a top view of the apparatus of *Figure 1*, showing the placement of the shovel and wheel within the yoke, according to the present invention.

[0024] *Figure 3* is a side view of the apparatus of *Figure 2*, showing an aspect of the adjustability of the handle of the apparatus, according to the present invention.

[0025] *Figure 4* is a schematic drawing of the apparatus of *Figure 3* showing the various dimensional relationships of the components of the apparatus of the present invention.

[0026] *Figure 5* is another schematic drawing of the apparatus of *Figure 3* showing the various forces acting at the fulcrum of the apparatus, according to the present invention.

[0027] *Figure 6* is a schematic drawing of an embodiment of the present invention showing the yoke having an "S-shaped" middle portion and a handle which is rotatable and slideably extendable.

[0028] *Figure 7* is a schematic drawing of an aspect of the present invention involving springs as an assist in propelling materials from the shovel blade, according to the present invention.

[0029] *Figure 8* is a schematic drawing of an aspect of an embodiment of the present invention showing blade rollers employed for ease of travel of the blade over rough ground, such as gravel surface, according to the present invention.

[0030] *Figure 9* shows a top view of an adjustable handle assembly.

[0031] *Figure 10* shows a handle assembly including an adjustable handle element capable of 360° fixed rotation.

[0032] *Figure 11* shows a side view of an exemplary yoke having an adjustable notched element in its middle portion.

[0033] *Figure 12* shows a top view of a shovel blade having arced walls.

[0034] *Figure 13* shows the side cut view of an angled shovel blade.

[0035] *Figure 14* shows a top view of a shovel blade – yoke attachment assembly having an attachment plate adjoining two elements of the yoke.

[0036] *Figure 15* shows a top view of a shovel blade – yoke attachment assembly having an angled attachment plate adjoining two elements of the yoke.

[0037] *Figure 16* shows a cut side view of the shovel blade – yoke attachment with angled attachment plate of *Figure 15*.

[0038] *Figure 17* shows a perspective view of an adjustable handle assembly embodiment.

[0039] *Figure 18* shows a perspective view of yet another adjustable handle assembly embodiment.

DETAILED DESCRIPTION

[0040] Referring now to the drawings, *Figures 1-8*, there are shown embodiments of the present invention involving the pick up, transport and disposal of materials in an efficient and effective manner.

[0041] Reference numeral **10** in *Figure 1* generally refers to an apparatus representing an embodiment of the present invention comprising a wheel assembly **100**, a driving member **110**, resembling substantially a U-shaped yoke having a handle **133** at its closed and a shovel blade **120** attached to its open end, wherein the yoke is mounted onto axle **190** of the wheel. The wheel and the blade are incorporated into the driving member in a manner that the blade rests on the ground in its normal position. An operator uses the handle to move the shovel in any direction by rolling the wheel on the ground. The operator also uses the handle to guide the shovel in shoving into the blade material lying along its path. The operator then lifts the shovel blade off the ground to pick up a load of material, followed by further lifting to balance the load at a comfortable walking posture. At destination, the operator presses on the handle with a quick downward body (or arm) motion, to propel the load away from the shovel. The operator can dispose the material either straight ahead by directing the shovel in the direction of the motion of the apparatus, or to the side by flipping the shovel sideways.

[0042] It will be appreciated by those skilled in the art and by ordinary users of snow shovels that the large wheel **100** shown in *Figure 1* (as further defined below and depicted in *Figure 3* relative to human dimensions) enables a user to lift snow and blade above unshoveled snow height and travel over it and rough surface without compressing unshoveled area to be traversed. The relatively high level handle of the shovel enables the user to comfortably accelerate forward the load of snow off the blade while pushing down the handle, which enhances the throw distance of the snow trajectory.

[0043] The wheel assembly **100**, driving member **110** and shovel **120** are formed ergonomically to assist in picking up and releasing a heap of material **160**, such as sand, gravel or snow, generally aligned in the direction of motion, with least stress to the body of the operator, and especially to prevent back stress or injury. As will be explained more in detail later in an embodiment of the present invention, a recoil assist is provided to the action of the operator of the apparatus from a fulcrum area of the apparatus to release the material in a brisk and efficient manner. The material can also be picked up and released while the wheel is stationary. Furthermore, the material can be throwingly released, or propelled, forward or sideways, as desired, while the wheel is stationary or in motion.

[0044] In an embodiment of the present invention shown in *Figure 1*, driving member **110** is formed preferably of continuous metal tubing that is shaped to have a handle **133** in its upper portion **130**, a fulcrum bearing area **145** in middle portion **140** and an open frame **155** in the lower portion **150** to accept blade **120**. Handle **133** is extendable at **115** to permit length, height and leverage adjustments, as will be described in more detail later in the various embodiments of the present invention. Fulcrum bearing area **145** shown in the same *Figure 1* comprises an opening in the middle portion **140** of the driving member, preferably capable of receiving a roller bearing (not shown). A portion **195** of axle **190** of the wheel assembly **100** fits inside the fulcrum area **145** of the driving member. The attachment point at **145** is designed to reconfigure the shovel for user height, strength and snow conditions. An attachment that can slide along the middle portion of the driving member can be used to adjust the height of the handle for leverage as well as for ease of operation of the apparatus. Aspects of the function of the fulcrum, and attachments thereto, will be explained in more detail below with respect to the relationship of the fulcrum to the handle and the shovel for disposing of materials from the shovel in a brisk, and yet ergonomically advantageous manner.

[0045] In an aspect of the embodiment shown in *Figure 1*, the driving member **110** is formed in an elongate U-shape, resembling a yoke, with an upper portion providing the handle **133**, and a narrowed middle portion **140** with distal sides to accommodate the axle **125** of the wheel assembly **100**. The distance between the relatively long legs (encompassing generally the middle portion **140**) of the U-shaped driving member **110** is determined by braces **117**, **119** and **157** formed judiciously between the legs so that the axle fits in the fulcrum areas **145**. It will be known to those skilled in the art that any number of different ways can be employed to attach the axle of the wheel in the openings forming the fulcrum areas **145**. For example, the well-known quick release for bicycle wheels can be employed. Or, the axle, in the form of a tube having protrusions **195** with inside shoulders (not shown) can be snapped into openings **145** by gently spreading apart the legs **140** of the U-shaped driving member. These wheel mounting features are well known in the art and as they are not significant to the invention, they are not described in detail here in order not to unnecessarily obscure the present invention. It is preferred that the tubing material for the driving member **110** comprises hollow

aluminum, or other metal tubing. Non-metal materials, such as plastics may also be used.

[0046] In another aspect of an embodiment of the present invention, wheel assembly **100** comprises a wheel **170**, a rim **175** and spokes **180** which connect the axle **190** to rim **175**, as shown in *Figure 1* and in top view of *Figure 2*. Different types of wheels, including different treads, widths or a continuous web connecting the axle to the rim can also be used. Relatively narrow wheels, such as shown in *Figure 1*, provide the advantage of not packing down snow, for example, when shoveling snow. The dimensions of wheel **170** and the position of handle **133** relative to axle **190** of the wheel are determined generally with respect to the position of the arms of a human body. A relative position of handle **133** with respect to a general body posture is shown in *Figure 3*.

[0047] In still another aspect of an embodiment of the present invention shown in *Figure 4*, it is preferred that the wheel diameter **a** is between about 30 to 36 inches, while the height of handle **110** from a datum plane directly under the wheel, that is, from a ground datum **x**, is between about 48 to 60 inches. The height of handle **133** from the center of axle **195** is preferably between about 26 to 42 inches. In another aspect of the present invention, further adjustment of the height of the handle is provided by a telescoping means **115**, such as a sliding hollow outer tube over an inner tube as shown in *Figure 3*, which ensures better ergonomic comfort. The over-all length **d** of the wheeled shovel is between about 78 to 88 inches. Distance **e** from the tip of the shovel blade **120** to the fulcrum area **145** near the center of the wheel assembly **100** is between about 32 to 42 inches. Distance **f** from the fulcrum area to the tip of the handle shown in *Figure 4* can be varied depending upon the preferences on the part of the operator. For example, distance **f** can be adjusted to make it easier to pick up and lift a load, balance the load on the apparatus more evenly for ease of transport to a location, and/or to gain more leverage in shoving the load from the shovel at the location of interest.

[0048] Thus, it will be apparent to those skilled in the art that the relationship between the relatively large diameter of the wheel, over-all length of the shovel and the height of the shovel handle from the ground determine the ease with which snow may be shoveled. The chest-high position of the handle assists in pushing the accumulated snow or other material that is being shoveled. A ratio

grater than 1:1 between the length of the yoke and the height of the handle provides the ease with which a blade full of snow can be lifted as the handle is lowered. This leverage ratio can be varied by varying the point at which the yoke connects to the axle. Furthermore, differently shaped yokes, such as shown in **Figures 4 and 5**, contribute differently to the efficiency of the shovel. A preferred "S-shaped" yoke is shown in **Figure 6**, and will be described in more detail later in the preferred embodiments of the present invention.

[0049] In addition to the ergonomic advantages, the embodiments of the present invention provide enhanced functional performance through a judicious use of a fulcrum line formed at the central portion of the wheel assembly shown in **Figure 5**. Line x' passing through the center of the fulcrum area **145** parallel to the ground datum line x forms the fulcrum line. A force F applied to the fulcrum through an action at the handle **133** can be resolved into a horizontal component F_h and a downward vertical component F_v , as shown in **Figure 5**. With no substantial resistance to the horizontal component F_h , the wheel rolls to the left, in accordance with the direction of the applied force F shown in **Figure 5**, while the ground under the wheel reacts to the downward component F_v giving rise to an upward recoil reaction $-F_v$ by the wheel. A brisk and mostly downward action on the handle, using arm and/or body weight, for example, produces a recoil assist to the throwing power. The magnitudes of the component vectors are determined by angle β , of the transmittal force F substantially by angle θ . Angle Ω contributes to the throwing power. Furthermore, the shovel blade can be formed in different configurations to assist in efficient release of material **160** from the shovel. For example, the shovel blade can have a bottom portion with a relatively large radius of curvature p , resembling a scoop, for easy slide of material from the shovel, as well as for keeping the material from sliding backwards and spilling off the shovel. It will be appreciated by those skilled in the art that these various parameters can be set to values that are commensurate with the ergonomic and functional requirements of the apparatus of the present invention.

[0050] **Figure 12** shows a shovel blade **245** having a load carrying inner surface **260** having arced walls **250** having the side walls tapering to near nothing near the leading edge **255** of the shovel blade **245** (both side walls are tapered). In a preferred embodiment shown in **Figure 13**, the shovel blade **245** is arced in side view **265** so as to form an angle between its upper and lower portion.

[0051] *Figure 6* illustrates a preferred embodiment of the invention with similar characters and numerals referring to similar parts throughout the several views. The side-view of the yoke shown in *Figure 6* has an upper portion **130**, middle portion **140** and a lower portion **150**. The yoke is attached to wheel **170** (shown in phantom) at its axle **195** (not shown) in a notch **O** of a slideable sleeve **143**. Sleeve **143** can be slid (in the direction of either one of the arrows shown in the same figure) over portion **150** of the yoke to change the position of fulcrum **145**, the effective leverage length **f** and the "throw arm" **e**. The throw is accomplished by pushing handle **133** in a downward direction to the phantom position **133'**. The primed reference numerals, namely, **130'**, **135'**, **140'**, **150'** and **120'**, show other parts of the yoke **110**, including the shovel blade, in a position following the downward motion of the handle of the yoke **110**. It will be understood by those skilled in the art that various different mechanisms can be used to adjust the fulcrum point to achieve the desired leverage for throwing the load off the shovel.

[0052] In *Figure 11*, there is shown a side view of a yoke or driving member **110** having an adjustable length notched element **205**, for example a bar, in the middle portion with one or more notches **210** which allows the fulcrum point to be changed without changing (or reducing the amount of change in the height of the handle above a plane positioned at the bottom of the wheel necessary to effectuate the same applied force:load displaced ratio), the length of the yoke portion above the middle portion and/or changing the length of the yoke portion below the middle portion. The notches may be various shapes such as rectangular, square, circular, or angled. Angled slots may be preferred as they may reduce the inclination of the wheel in respect to the notched element to permit better fixation.

[0053] By changing the notch **210** associated with the axle (e.g., the axle sitting in the notch), the leverage changes even if the structure, height and/or length of the yoke **110** does not change. The notched element **205** may further be configured such that repositioning along the element among the notches can cause a change in the angle of the shovel blade with respect to the ground, such as a change from shape **215** to shape **220**. Reducing the angle of the shovel blade as it strikes the ground reduces friction. In such embodiment, there is shown a yoke **110** having a handle section **133**, an "S-curved" middle section having an upper elbow **225**, a lower elbow **230**, a middle elbow **235**, a linear section **240**, and a shovel blade

section of shape 215 and shape 220. *Figures 11b* and *11c* illustrate other notched element 205 embodiments that may be employed (only a portion of yoke 110 is shown). Notched element 205 of *Figure 11b* illustrates angled notches 210' which allow for improved holding of the yoke 110 to the axle as the yoke 110 is moved back and forth. Notched element 205 of *Figure 11c* comprises openings 210" in the form of hole(s). Attachment through holes further enhances the holding of the yoke 110 to the axle as the yoke 110 is moved back and forth.

[0054] An aspect of an embodiment of the present invention involves an "S-curved" section forming the middle portion 140 of the yoke shown in *Figure 6*. The substantially "S-curve" (including the substantially straight section in the middle portion of the curve) is integral to optimizing "gearing"/leveraging in order to enhance the acceleration of the blade and throwing of the load faster, higher and farther from the shovel. The "S" shape is formed to have the lower curve, subtending angle ϕ . Angle ϕ of the lower portion of the "S-curve" and angle ϕ' of the upper portion, as shown in *Figure 6*, are both preferred to be between about 80° and 90°, though it will be appreciated that other angles may also be used. In one embodiment (not shown), with unanticipated leverage ability, the included angle ϕ' is between about 80° to about 120°, or more advantageously between about 80° to about 100°, and between about 80° to about 90°, and the angle ϕ is between about 110° to about 165°, or about 120° to about 155°. In such cases, the upper angle with the lower angle provide for a top handle section that can be relatively straight and horizontal. This may enhance performance, for example, by allowing a straight section that allows for ease in handle-length extension without necessarily the need to significantly change handle height as compared to other configurations. It may also allow the user to exert greater force without unduly increasing the friction of the shovel with the ground as compared to other configurations. Turning back to *Figure 6*, as handle 133 is lowered, the elbow of the lower portion of the "S-curve" travels a distance **A** through arcs Σ_1 and Σ_2 , as shown in the same *Figure 6*. The straight portion of the S-curve traverses the arcs Δ_1 and Δ_2 . As the handle is lowered, the "S-curve" starts moving downward and the handle thus only needs to be lowered an amount equal to **T** in order to lift blade 120 to height **M** in new position 120'. It is an aspect of the present invention that, as the middle portion 140 comprising the "S-curve", including the straight section, is positioned closer to the fulcrum area 145, the magnitude of **A** and leverage ratio **M/T** (the ratio of blade

lift to handle movement) are varied accordingly. It is preferred that the length **H** of the straight section of the "S-curve" is greater than **A** so that throughout the entire range of handle motion, the desired leverage (based on axle attachment point) or "gearing", is maintained as the blade is raised and lowered. Thus, for optimal operation (i.e., comfortably, and without bending on the part of the operator of the shovel) it is preferred that the maximum travel **T** of handle **T>H>A**, $\Delta_1 \approx \Delta_2$, and $\Sigma_1 \approx \Sigma_2$.

[0055] In another aspect of the present invention, the handle portion **133** shown in *Figure 6* has a shank **134**, which slideably and rotatably fits inside hollow sleeve section **135**. Handle **133** can be pulled out, pushed in and/or rotated in order to find the most ergonomic position for shoving, picking up and throwing a load from the shovel. Shank **134** can be slid to any one of continuous positions along sleeve **135** by utilizing friction hold against the inside surface of the hollow sleeve **135**. However, pins **137** are preferred which engage holes **139** judiciously placed along the length of section **135**. Length **E** along handle **133** is between about 12 to 18 inches, while length **L** along section **135** is between about 16 to 24 inches, although other lengths can also be used. The over-all length **d** of the shovel apparatus can be increased by Δ_d , preferably between about 6 to 12 inches, while the over-all height **c** can be increased by Δ_c , preferably between about 4 to 8 inches, thus yielding an over-all length **G** between about 89 to 100 inches and over-all height **I** between about 42 to 66 inches. With the preferred dimensions cited here, the shovel blade can be comfortably raised to a height between about 36 to 44 inches.

[0056] *Figure 9* shows a handle assembly **275** wherein a "U-shaped" handle bar **280** is housed in its middle part in cross housing **290** supported by two support bars **300, 300'**. "U-shaped" handle bar **280** is shown to be moveable within cross housing **290** comprising a tubular housing. Handle bar **280** is also shown to comprise hand grips **305, 305'**.

[0057] *Figure 10* shows a handle assembly **275'** wherein the assembly includes adjustable handle elements **310, 310'** inserted into open tubular handles **315, 315'** (**315, 315'** each show two configurations of the handle element), such handle elements to provide friction to the inner walls of open tubular handle **315, 315'** and to permit sliding of the adjustable handle elements within **315, 315'** to

allow for 360° movement. Handle elements 315, 315' may be covered with a covering (not shown) for aesthetic reasons and/or for easier gripping.

[0058] *Figure 17(A)* shows a perspective view of a handle assembly embodiment 350. Such embodiment includes an attachment plate 355 which may be, for example, welded or attached in some other fashion to the yoke 387. Attachment plate 355 includes a plurality of attachment conduits 360, shown as holes in the illustration, positioned for attaching engagement with corresponding attachment conduits 360', also shown as holes in the illustration, associated with handle 370. Handle 370 is shown to comprise a horizontal bar 375, which may be tubular in configuration, fixed to a bent plate portion 380 having a lower portion comprising attachment conduits 360'. Conduit(s) 360' can be attached to corresponding conduit 360 in attachment plate 355 by way of fastener 385, such as a bolt. The bend in the bent plate portion 380 of handle 370 allows the handle to be flipped over and installed upside down to change handle height, and the different attachment conduits allow the handle height to be set at different heights. *Figure 17(B)* shows another handle assembly embodiment wherein the end of the yoke is adapted to include an expanded open attachment end 387 having a top attachment plate 355' with attachment conduits 360 (shown as holes), a bottom plate (not shown) opposed to said top attachment plate 355' (the bottom plate also preferably constituting an attachment plate with attachment conduits), and an open end 386 configured to permit the bent portion of handle 370 to fit between the top attachment plate 355' and the bottom plate. One or more, preferably all, attachment conduits in top attachment plate 355', in the bent portion of handle 370, and in the bottom attachment plate (not shown) are preferably matched to allow a fastener 385, for example a bolt, to course through each. Fastener 385 may lock the attachment through other attachments such as a nut 362.

[0059] *Figure 18* shows a perspective view of yet another adjustable handle assembly embodiment 390. Such embodiment also comprises a handle 370 comprising a horizontal bar 375 affixed to a bent plate portion 380 having a lower portion comprising attachment conduits 360'. As opposed to the embodiment in *Figure 17*, rather than attachment plate 355 (of *Figure 17*), corresponding conduits 360 are found in the yoke proper 387. Conduit(s) 360' can be attached to corresponding conduit(s) 360 in yoke 387 by way of a fastener 385, for example a bolt. Alternatively, such attachment of handle 370 to yoke 387 can be done by

slotted section such that they attach to one another without a fastener but are still secure (not shown).

[0060] In another aspect of the present invention, a plurality of springs **200** (only one shown in the side view in *Figure 7*) are utilized to provide an enhanced recoil reaction at the fulcrum line when the tire used for the wheel **170** is not as flexible as for example, a bicycle tire with a pneumatic tube. In *Figure 7*, axle **190** is adapted to receive one spring at each of the two respective ends **195** of the axle which act as a fulcrum and transmit a recoil reaction to shovel blade from an action applied at the axle.

[0061] In still another aspect of the present invention, rollers **210** are attached to the bottom of shovel blade **120** for ease of traversing over rough ground surface **220**, such as gravel, as shown in *Figure 8*. It will be obvious to those skilled in the art that rollers will also reduce friction with the ground, especially as more load accumulates on the shovel while the shovel is being pushed forward to pick up more material, such as snow, from the ground. Similar rollers with similar reference numerals are shown in *Figure 6* where the primed numeral corresponds to the position of the rollers when shovel **120** is elevated. As seen in *Figure 6*, the shovel to which the roller is attached has a lateral dimension **P** between about 15 to 18 inches.

[0062] *Figures 14 – 15* show a shovel blade – yoke attachment assembly **320**. Such assembly includes yoke blade attachment ends **330, 330'** and attachment plate **325** having a plurality of attachment portions **335**, shown in the figure as a number of holes through which affixing devices, such as bolts, may be placed. The attachment to the shovel blade may or may not entail components or load surface of the shovel blade. In *Figure 15*, a preferred attachment plate **325** having a horizontal plane portion **340** and angled plane portion **345** are shown. An included angle may be about 120° to about 170°, or about 130° to about 150°. The angle gives strength to resist bending of the plate. The angled plane portion **345**, when not affixed to the shovel blade, allows a flexing and recoil of the shovel blade, aiding in loading and unloading of a load. *Figure 16* shows a cross-sectional view of such angled plate.

[0063] The embodiments of the present invention shown in *Figures 1 – 14* are adaptable for various enhancements and improvements in useful ways. For

example, a shovel blade may be designed with a more flexible material to enhance the ability to throw the shovel load. The flexibility of the blade would provide a trampoline effect as the blades flexes back to its original shape from a bent shape as it accelerates to unload the load. A comparable effect is obtained by attaching the shovel blade to the shovel yoke with a spring-loaded hinge (not shown) that enhances the throwing capacity of the wheeled shovel. Furthermore, shovel blade **120** is fitted with side walls **125** as shown in *Figure 3* in order to be able to pick up and retain liquid like substances, such as snow slush. In another aspect, the driving member, resembling a yoke, is made to fold at the fulcrum area where a quick release wheel is mounted and removed readily for ease of transporting the apparatus. As an alternative, the driving member comprises two halves (not shown) attached to each other at the fulcrum area **145** of *Figure 1*. It will also be understood that a plurality of wheels of various widths can be used instead of the one wheel shown in *Figures 1-8* of the present invention. Further, the apparatus can be motorized to pick up, transport and propel a load of material from the wheeled shovel of the present invention. Also, motor energy can be utilized to store energy in a spring or in other energy storing device, which in turn can be used on demand to assist in pushing and/or throwing the load on the shovel.

[0064] Though these numerous details of the disclosed apparatus and method are set forth here, such as the various dimensions, to provide an understanding of the present invention, it will be obvious, however, to those skilled in the art that these specific details need not be employed to practice the present invention. That is, while the invention has been particularly shown and described with reference to the embodiments thereof, it will be understood by those skilled in the art that various changes in form and details may be made without departing from the spirit and scope of the invention.

What is claimed is:

- 1.** An apparatus for removal and disposal of materials comprising:
 - a wheel assembly having a rim and an axle connected together with spokes radially projecting from the axle, the axle including a fulcrum member capable of transmitting a recoil reaction to an action;
 - a yoke having an upper portion, a middle portion and a lower portion, wherein the middle portion is attached to the fulcrum member of the axle and has an "S-shape" defined by a lower portion included angle ϕ and upper portion included angle ϕ' wherein ϕ' is between 80° and 90° ;
 - a handle attached to the upper portion of the driving member and capable of moving the wheel assembly, wherein the ratio of the length of the yoke to the height of the handle is greater than 1:1;
 - a blade attached to the lower portion of the driving member, the blade adapted to pick up a load of material from a surface when the blade is lowered to the surface by raising the handle and pushing forward; and
 - wherein the blade springs upwards and forwards, thereby releasing the load of material briskly away from the apparatus when the handle is pushed downwards to cause the wheel to compress and recoil through the fulcrum member at the axle of the wheel.
- 2.** The apparatus according to claim 1, wherein the lower portion included angle ϕ is between about 110° to about 165° .
- 3.** The apparatus according to claim 1, wherein the wheel assembly has a quick release for disconnecting the wheel assembly from the driving member.
- 4.** The apparatus according to claim 1, wherein the lower portion included angle ϕ is between 80° and 90° .
- 5.** The apparatus according to claim 4, wherein the blade comprises a curved surface and having side walls along its periphery tapered from the back of the blade to the leading edge of the blade.
- 6.** The apparatus according to claim 1, wherein the yoke has a notched element in said middle portion, wherein the notches are configured to allow different positional attachment of the yoke in respect of the axle.

7. The apparatus according to claim 1, wherein the blade is attached to the yoke by way of an attachment plate having corresponding holes as found in the blade and a fixation element fixing the corresponding holes to one another.
8. The apparatus according to claim 1, wherein the distance between the tip of the blade and the fulcrum area is between about 32 to 42 inches.
9. The apparatus according to claim 8, wherein the height of the handle from a datum place under the wheel is between 48 to 60 inches.
10. The apparatus according to claim 8, wherein the height of the handle from the center of the axle is between 26 to 42 inches.
11. The apparatus according to claim 1, wherein the upper portion included angle ϕ is alternatively between about 80° to about 110° .
12. The apparatus according to claim 1, wherein the overall length of the apparatus is between about 78 to 88 inches, and can be increased to between about 89 to 100 inches.
13. The apparatus according to claim 1, wherein the lower portion included angle ϕ is between about 140° to about 160° .
14. The apparatus according to claim 1, wherein the height of the handle from a datum plane directly under the wheel is between about 48 to 60 inches, and can be increased to between about 42 to 66 inches.
15. The apparatus according to claim 7, wherein the attachment plate is angled.
16. The apparatus according to claim 1, wherein the handle is configured to be adjustable in position in respect of the yoke.
17. An apparatus for removal and disposal of materials comprising:
 - a wheel assembly having a rim and a axle, the axle further comprising a tubular body having two ends adapted to receive spokes which connect the axle to the rim;
 - the axle further adapted to receive a plurality of springs at the two respective ends of the axle to act as a fulcrum and transmit a recoil reaction to an action applied at the axle;
 - an elongate U-shaped driving member having a curved upper portion, a generally straight middle portion and an open lower portion, wherein the middle portion is attached to the springs at each end of the axle;

a handle formed from the upper portion of the driving member, the handle capable of moving the wheel assembly; and

a shovel blade attached to the lower portion of the driving member, the shovel blade adapted to pick up material from a surface when the blade is lowered to the surface by raising the handle and pushing forward;

wherein the blade springs upwards and forwards, thereby releasing the material briskly away from the apparatus when the handle is pushed downwards to cause the springs to compress and recoil through the fulcrum member at the axle of the wheel.

18. The apparatus according to claim 17, wherein the axle comprises a tubular body having first and second ends which support spokes connecting the axle to the rim, the tubular body forming the fulcrum member.

19. The apparatus according to claim 17, wherein the plurality of springs comprise a pair of springs, one spring at each end of the two ends of the axle.

20. The apparatus according to claim 17, wherein the pair of springs is compressed when the handle is pushed downwards, the compression providing the recoil action.

21. The apparatus according to claim 17, wherein the blade has two sidewalls and a back wall to keep the load of material from spilling out from the blade.

22. The apparatus according to claim 17, wherein the blade is shaped in the form of a scoop having a radius at the bottom.

23. The apparatus according to claim 17, wherein the driving member comprises a tubular material.

24. The apparatus according to claim 23, wherein the tubular material comprises metal.

25. The apparatus according to claim 17, wherein the handle is slidably adjustable through a telescoping tubular material inside a hollow tubular driving member.

26. The apparatus according to claim 17, wherein the overall length of the apparatus is between about 78 to 88 inches, and can be increased to between about 89 to 100 inches..

27. The apparatus according to claim 17, wherein the diameter of the wheel is between about 30 to 36 inches.

28. The apparatus according to claim 17, wherein the height of the handle from a datum plane directly under the wheel is between about 48 to 60 inches, and can be increased to between about 42 to 66 inches..

29. The apparatus according to claim 17, wherein the load of material comprises sand and gravel.

30. The apparatus according to claim 17, wherein the load of material comprises snow and slush.

31. A method of snow removal, comprising the steps of:

providing an apparatus comprising a relatively large wheel substantially at the waist level of an operator, a yoke having a closed handle end and an open end, a shovel blade at the open end of the yoke, wherein the yoke is mounted onto an axle of the wheel at a middle portion generally "S-shaped" having an upper portion comprising an upper elbow and a lower portion comprising a lower elbow wherein the yoke is mounted onto the axle and configured in a manner such that upon movement of the yoke about the axle, the upper elbow moves a distance H that is greater than the distance A moved by the lower elbow;

moving the apparatus along a path by pushing the handle and rolling the wheel in a direction commanded by the handle;

shoving onto the blade a load of material lying along the path of the apparatus;

pressing the handle downwards, after picking up the load of material, to lift the shovel blade to a level that clears the path;

adjusting further the level of the shovel blade to achieve a balanced load with respect to and over the axle of the wheel;

transporting the balanced load of material to a destination; and at destination

briskly applying body weight at the handle to propel the load of material to a substantial distance away from the apparatus.

32. A method according to claim 31, wherein the yoke of the apparatus provided has a middle portion between the upper and lower elbow having a notched element configured to allow different positional attachment of the yoke in respect of the axle.

- 33.** A method according to claim 31 wherein the apparatus provided has an overall length of between about 78 to 88 inches which can be increased to between about 89 to 100 inches.
- 34.** A method according to claim 31, wherein the apparatus provided has a "T-shaped" handle attached to a bent yoke attachment plate.
- 35.** A method according to claim 31, wherein the apparatus provided has a handle portion adjustable in position in respect of the yoke.
- 36.** A method according to claim 31, wherein the apparatus provided has a handle portion that can rotate 360°.
- 37.** A method according to claim 31, wherein the apparatus provided has an axle that is adapted to receive a plurality of springs at the two respective ends of the axle to act as a fulcrum and transmit a recoil reaction to an action applied at the axle.
- 38.** A method according to claim 31, wherein the apparatus provided has a wheel adapted to receive an elastic material capable of producing a recoil action to an action applied at the axle.
- 39.** A method according to claim 31, wherein the apparatus provided has a shovel blade with arced side walls tapering toward the leading edge of the shovel blade.
- 40.** A method according to claim 31, wherein the apparatus has a curved shovel blade.
- 41.** A method according to claim 31, wherein the apparatus provided has a shovel blade attached to the yoke through an angled attachment plate.

ABSTRACT OF DISCLOSURE

An apparatus comprising a shovel disposed on a relatively large wheel and a method of using the apparatus for handling a load of material. The apparatus involves a shovel having a handle formed at the end of an elongate yoke, the yoke being mounted, at its middle portion, onto the axle of a relatively large wheel for the purpose of picking up of a load, transporting it to a location, and propelling the load overboard with a quick arm/body motion on the part of a person operating the handle. The substantially waist-high wheel is adapted to receive the body force of an operator as an effective leverage through the handle and cause a recoil action from the wheel to enhance the throwing power of the apparatus of the invention, comprising the shovel, the wheel and the yoke as the driving member.

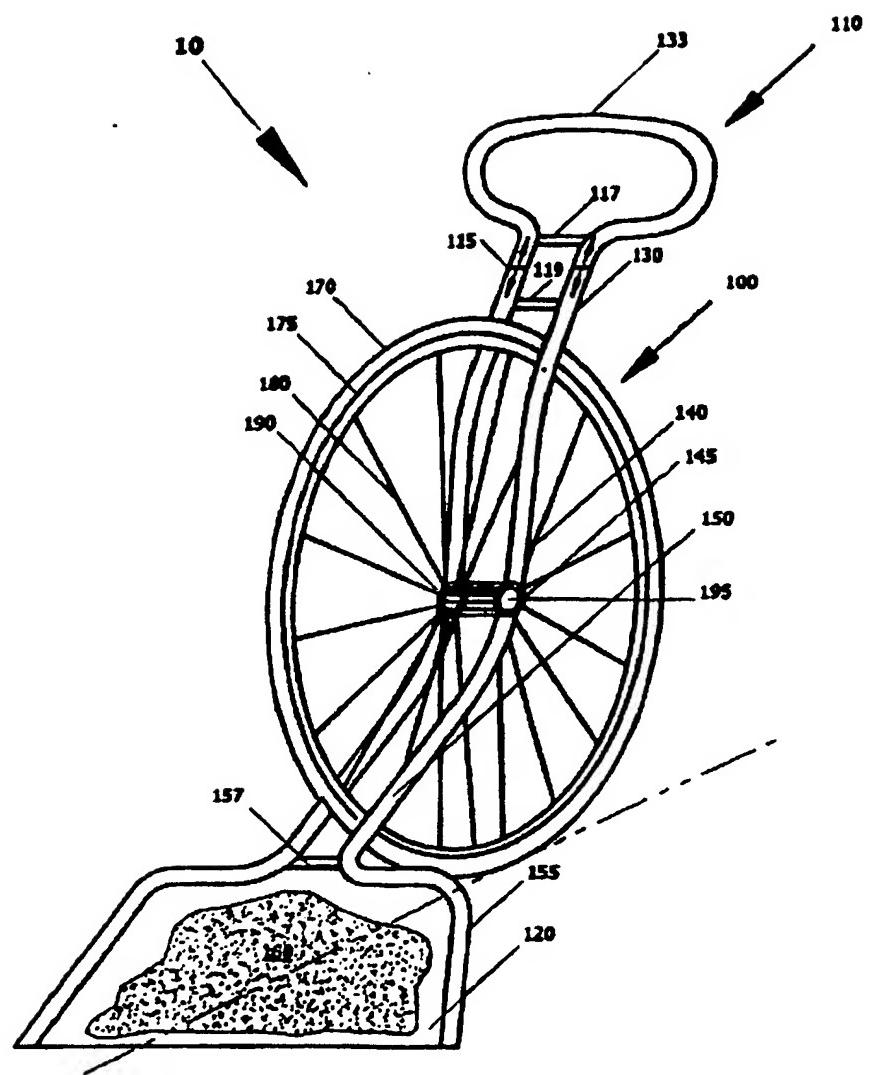


FIGURE 1

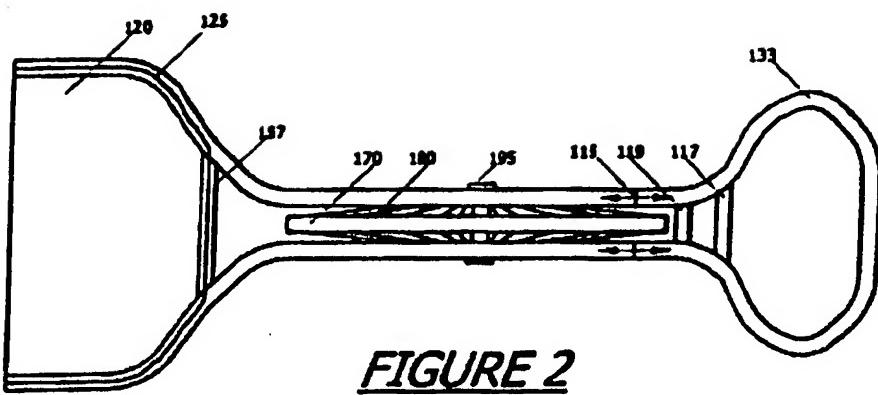


FIGURE 2

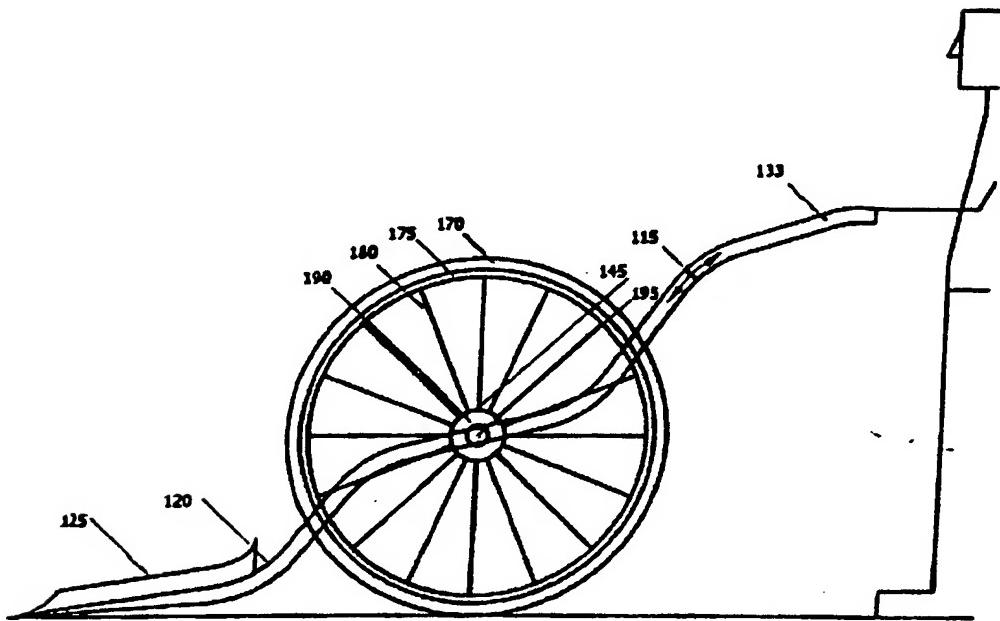


FIGURE 3

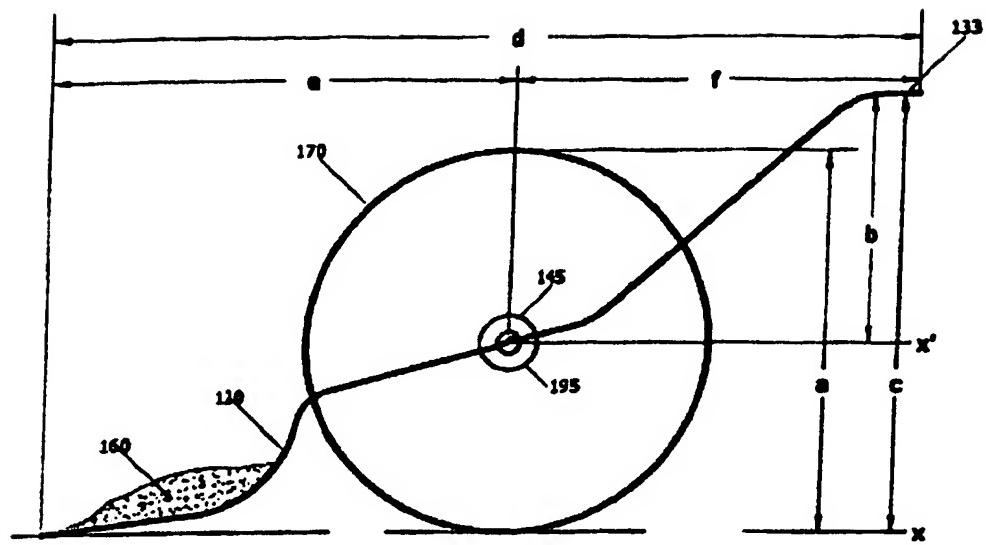


FIGURE 4

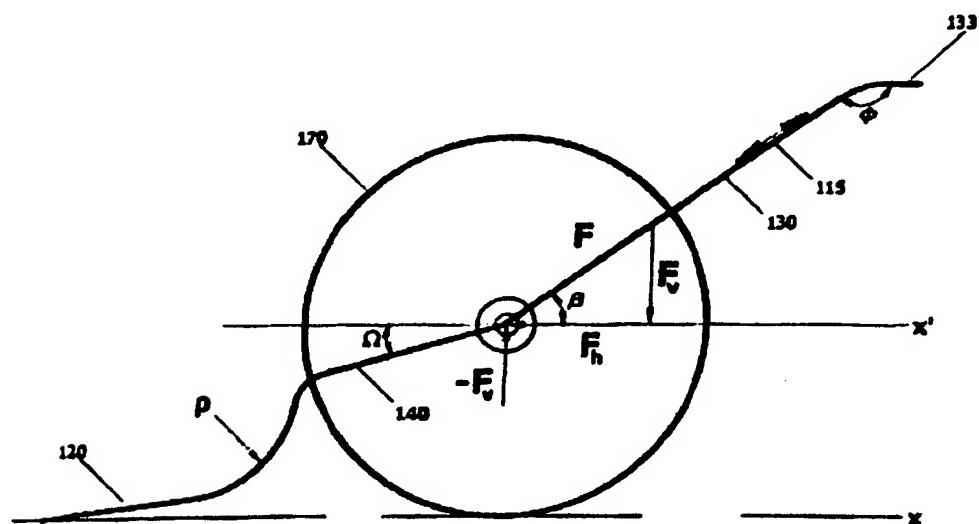


FIGURE 5

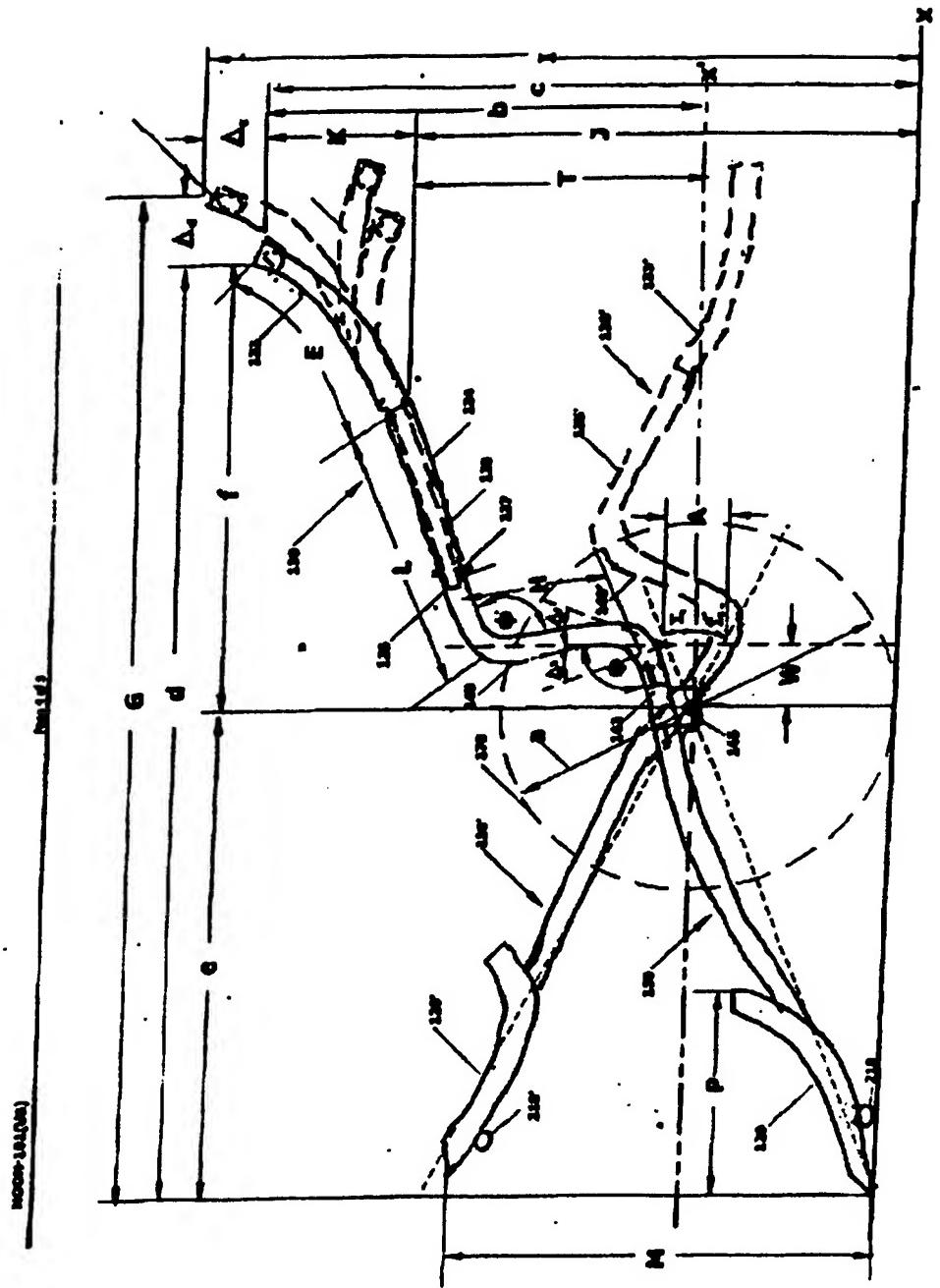


FIGURE 6

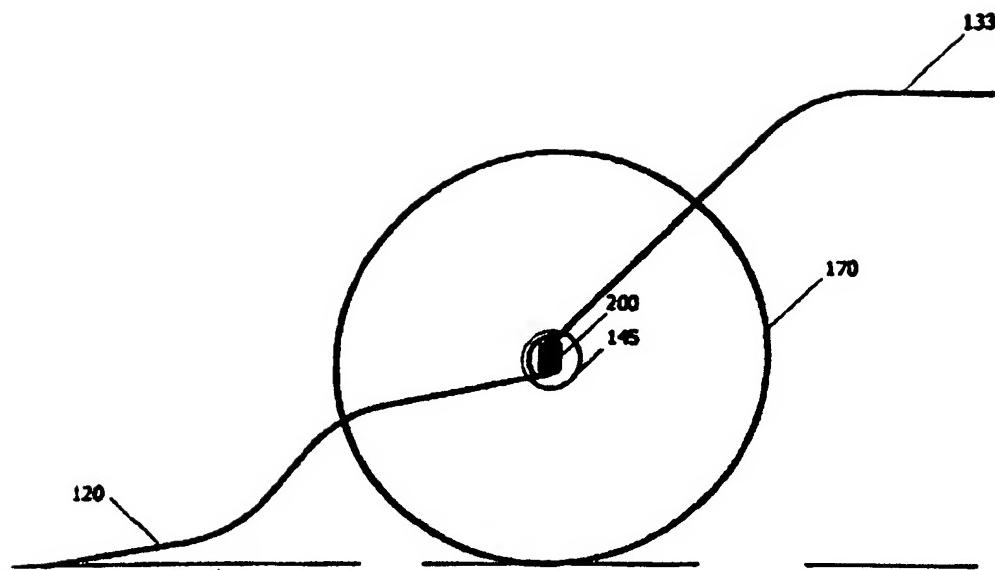


FIGURE 7

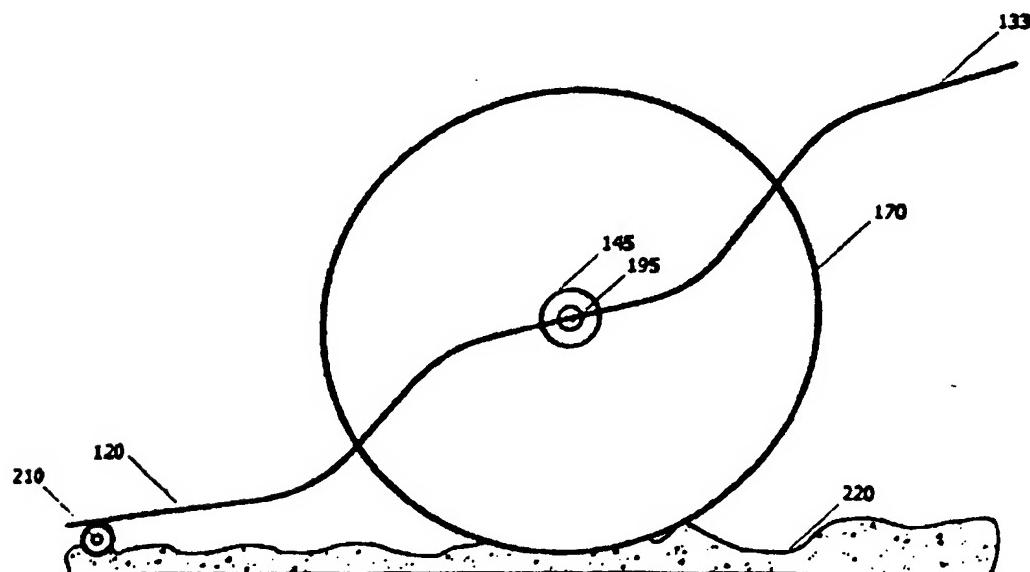


FIGURE 8

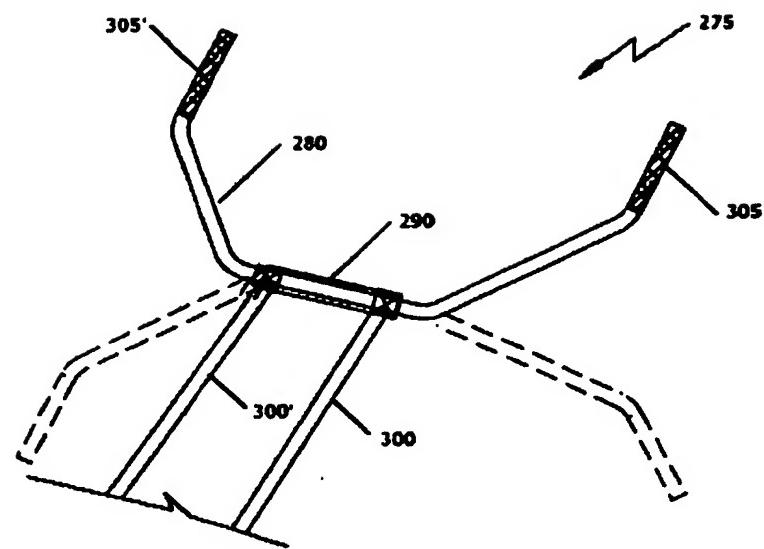


FIGURE 9

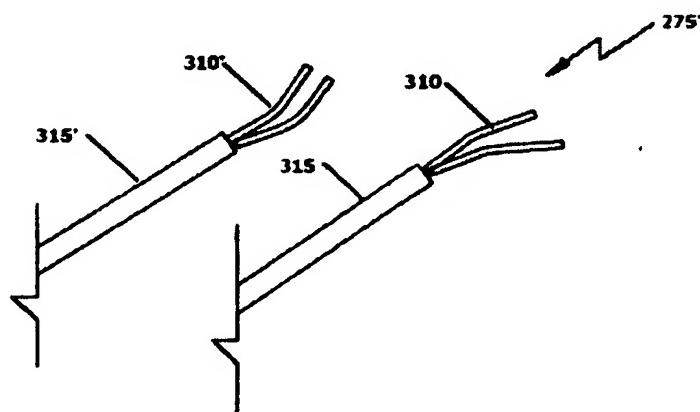


FIGURE 10

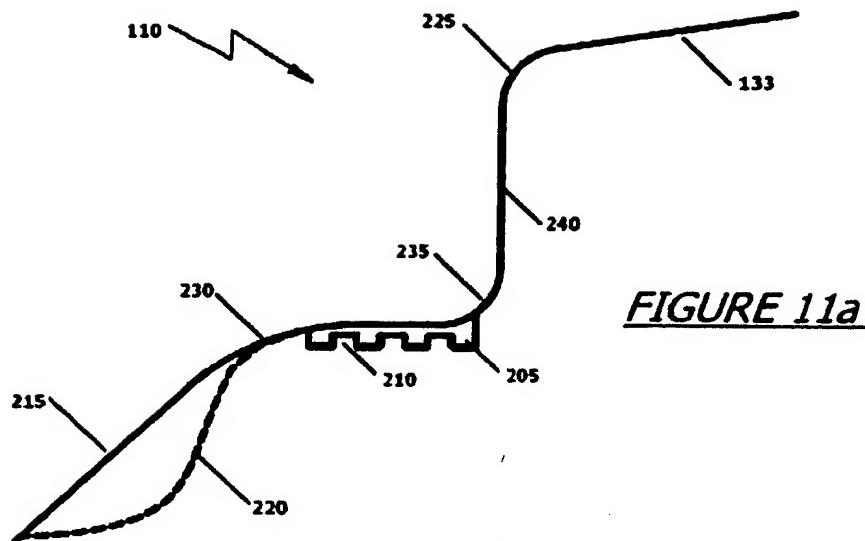


FIGURE 11a

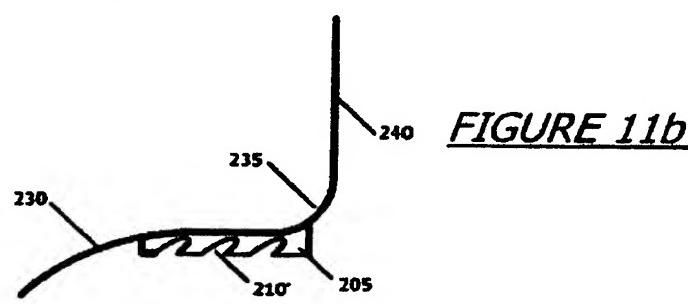


FIGURE 11b

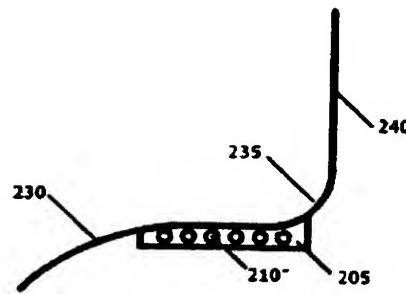


FIGURE 11c

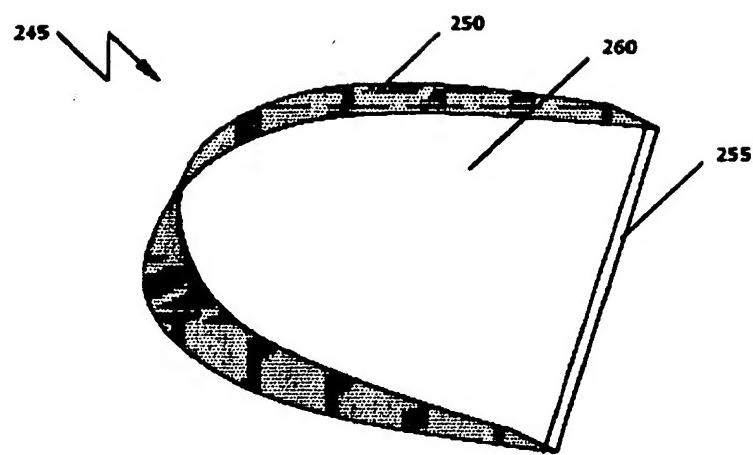


FIGURE 12

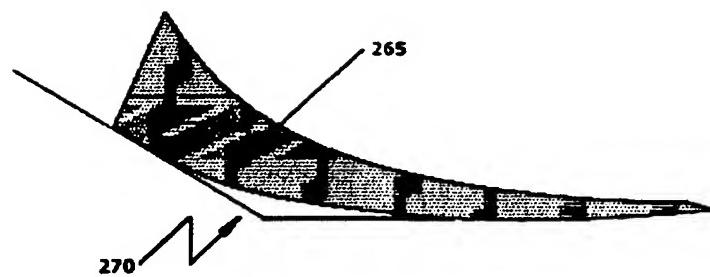


FIGURE 13

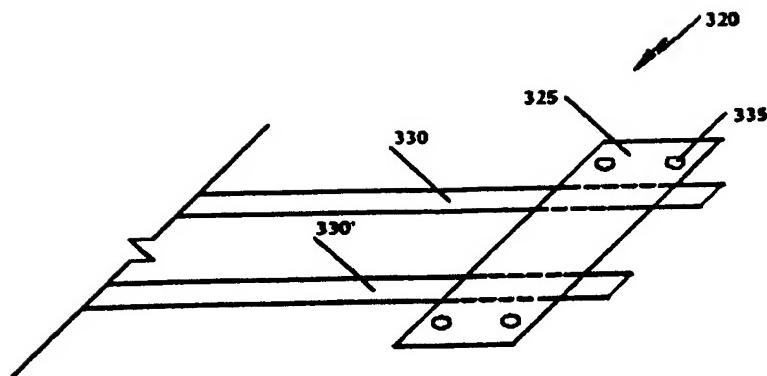


FIGURE 14

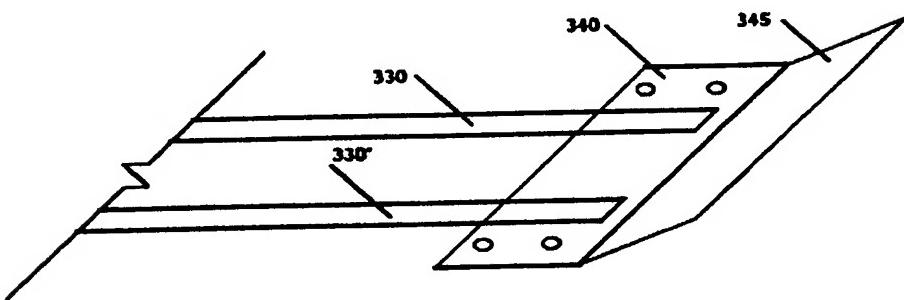


FIGURE 15

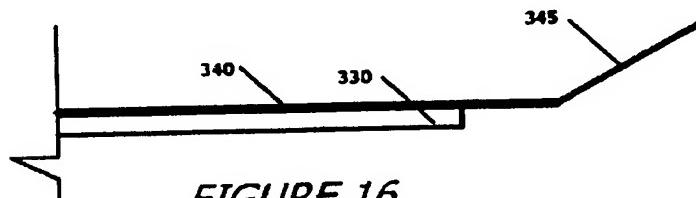


FIGURE 16

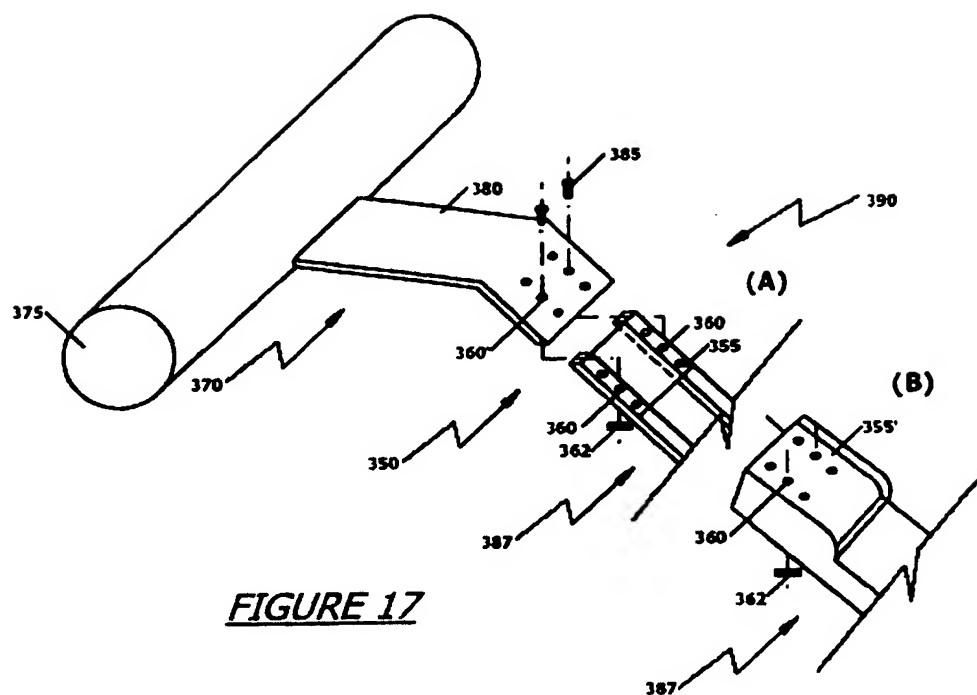


FIGURE 17

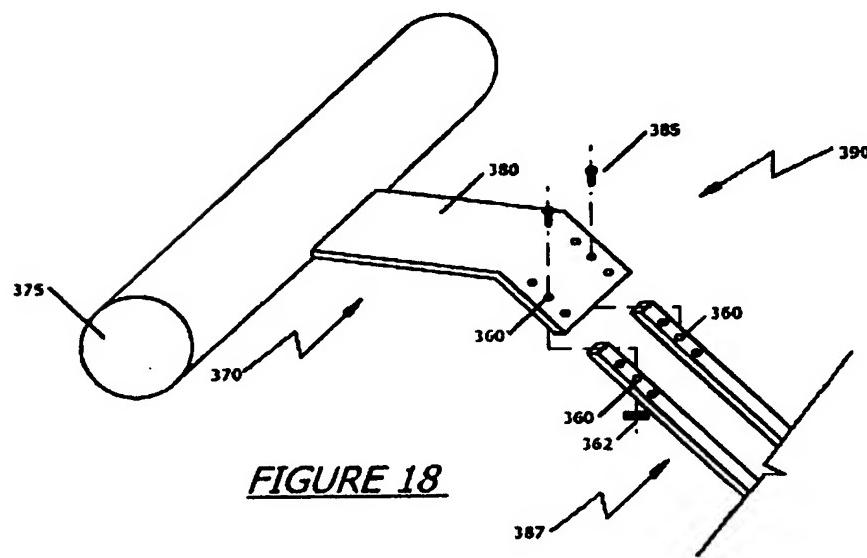


FIGURE 18

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